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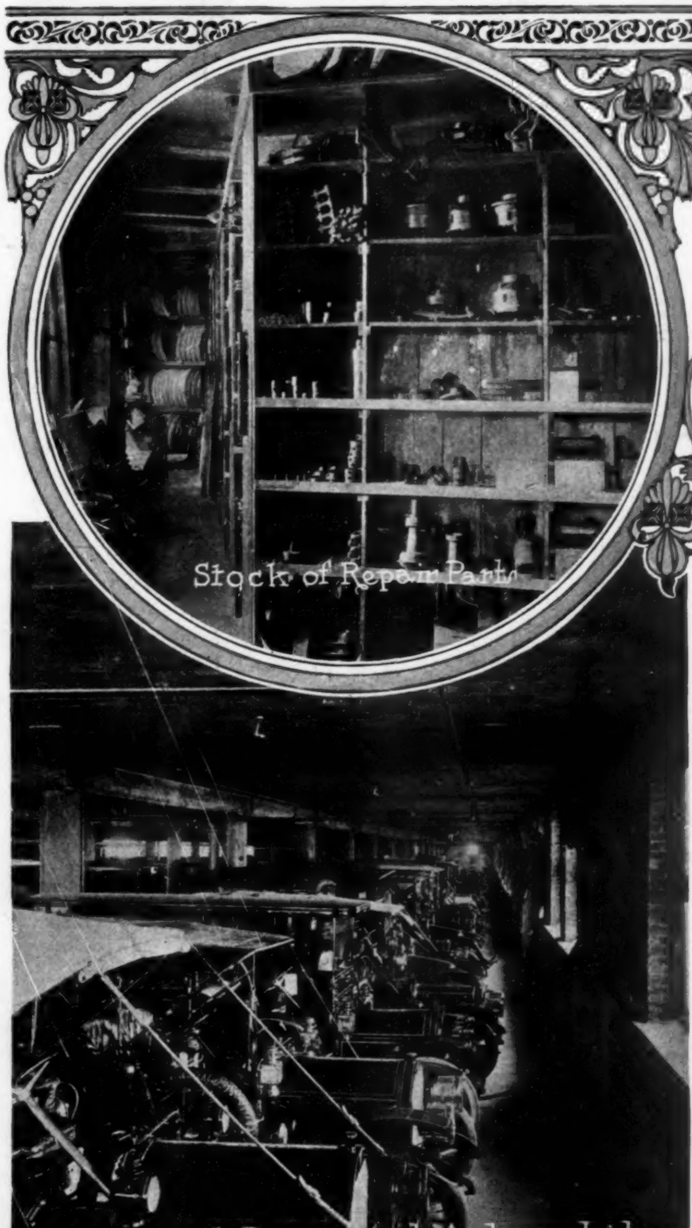
THE AUTOMOBILE

Getting Ready for the Road

Service Departments Working Day and Night



What it costs New York to operate its 40,000 automobiles is a matter of interest to everybody in motordom and everybody who wishes to be enrolled among the users of the automobile. A careful canvass of the situation by "The Automobile" tends to show that the total amount spent in operation aggregates over $90,000,000 annually for a total of 320,000,000 car miles.

NOW that gentle Springtime is treading upon the heels of cold weather every automobile owner in this section and every potential owner is preparing to take advantage of the road season. Ever since last Fall the establishments that specialize in overhauling cars have been busy preparing for the opening of the touring season and at present the apex of activity in this line has been reached. From the Harlem river to the sand-flats of Long Island, everything is buzzing that has anything to do with putting automobiles into commission and each shop, garage and service department is under high pressure.

There are something like 25,000 automobiles owned in New York that are habitually laid up during the winter for longer or shorter periods of time. These periods range from three weeks to three months and in exceptional cases run as high as six months. Some are merely placed in what is known as "dead" storage during the disagreeable season, but at certain times all of them are subjected to that mysterious process called "overhauling."

Where a motorist has a car that cost $5,000 the automobile represents an investment, and periodical "overhauling" of such a car stands in the relation of a protection for the investment as well as for insurance of service.

The idea of service has grown into an immense industry in the metropolis, for to-day practically every automobile manufacturer represented in the New York selling field has made some provision for the care, maintenance and upkeep of the cars of his make. Some of the companies have elaborate "service" departments that are considered quite as much parts of the local or district distribution plants as are the selling agencies themselves. Others simply maintain a garage where a full line of parts for the various models of the line are carried and where general repairs are done.

There is as much difference between the "service" departments as is apparent between the agencies, and the cost of "service" covers a range quite as wide as is represented in the

difference between the original cost of the cars. This does not mean that the mere fact that a car may cost $5,000 makes its upkeep five times as great as that of the car costing $1,000, although such may be the case.

It has been broadly estimated that the New York motoring public, which means the owners of gasoline pleasure automobiles in the metropolitan section, pays for operating its cars the sum of $93,400,000 annually. Last week in THE AUTOMOBILE it was shown that the same section of the public pays $42,000,000 a year for new cars. Thus the cost of operation, roughly, is twice as great as that of the original investment.

The constituent items of this vast sum are made up as follows:

There are 40,000 automobiles owned in New York City, representing an investment of about $80,000,000. The average mileage of each car is 8,000, which is approximately 25 miles a day the year round. Figuring at least eight tires for each car at that mileage gives a total of 320,000 tires and 800,000 tubes as New York's contribution to the national tire industry.

The cost of these would approximate $27,200,000 a year.

Gasoline, oil and grease would foot up $10,000,000.

Overhauling, $5,500,000.

Repair work, $3,000,000.

Parts and materials not supplied in the above items, $2,000,000.

Chauffeurs' wages, 21,000 at $1,300 a year, $27,300,000.

Garage at $30 a month or $360 per year, $14,430,000.

Interest on the investment at 5 per cent., $4,000,000.

The total is $93,400,000, which being equally proportioned among the cars owned in New York would be $2,335 per car as the average cost of operation. As the mileage is figured at 8,000, the cost per car mile would be more than 28 cents.

By eliminating the biggest item on the foregoing list, that embracing the wages of the chauffeur, amounting to $27,300,000, would reduce the cost of operation of the car to about $1,653 or a per mile cost of 20 cents. The interest on the investment may be questioned as a proper element in reaching operating figures and if that too is deducted the cost is further reduced to about 19 cents. Figuring the number of passengers at four to a car, the passenger cost per mile is about 4 1-2 cents. High as this may seem it is not excessive when compared with railroad rates, but it foots up to an enormous sum in the aggregate.

Depreciation Cannot Be Measured by Difference in Price Between New and Second-Hand Car

When a statistician sits down to study the cost of operating automobiles he will sooner or later come to the item of depreciation. There is no word in the language of motordom that has a wider construction and interpretation and, according to the men who have made the closest study of the situation, it is not a vital factor.

They argue that if a purchaser buys a car and drives it home where its pattern is not fancied by some other member of the family, requiring the car to be sold immediately, that the mere fact that the purchaser is not able to get full price for the car is no reason for supposing that the car is not as good as when it left the salesroom. They state with emphasis that, as far as mechanical depreciation is concerned with cars of modern manufacture, there is no such thing as long as the car will give the same quantity and quality of service that it did when new. They declare that nothing could be more unjust than to figure that the difference between the second-hand price of a car and its cost when new is "depreciation."

Fig. 4—In the Fiat repair shop, depicting the equipment used, including a traveling hoist shown in the foreground.

They point out that to-day there are scores of cars in full operation in New York which antedate 1905 and claim that there is not 1 cent's worth of depreciation in any of these as long as they give adequate service. There are scores of wealthy men in New York who run their own cars for health and pleasure. Some of these do a large part of the repair work and all of the chauffeur's work from selection and choice. One case is noted where a rich man has a car of 1902 fitted with the latest design of body and equipment, behind the wheel of which no chauffeur has ever reposed. He and his family drive, and they carry a man to make tire changes and to clean the machine.

There are 5,000 automobile owners in New York who do not care what it costs to operate their cars. They do not want to know what motoring costs them. This tendency has a myriad of expressions. Many of these owners have their cars overhauled clear to the rivets in the cross-members once each year. Many others subject their machine to similar treatment once in 15,000 miles. The rest send their cars to the shop, garage or service department whenever their chauffeurs advise such action.

This overhauling, which consists of taking down every part of the car from stem to stern, inspecting and examining each part and the repair and replacement of broken or worn portions of the mechanism, reassembling and sometimes painting, with complete tests as to the running of the automobile after such treatment,

Fig. 3—In the Packard service department, showing a part of the $125,000 worth of parts that are carried in New York by that company.

Fig. 5—In the Packard service department, showing an elevator used to distribute the automobiles to the several floors.

costs from $400 to $1,500, depending not only upon the amount of work necessary but also upon the place where the work is done.

Some of the companies advise a yearly overhaul, costing about $500, with which they assert the car will last indefinitely. One of these concerns claims that with this amount of care expended each year its cars will render service for a lifetime. Of course the automobile industry is too young and this particular phase of it is too recent for demonstration in actual practice. It is a patent and undeniable fact that the lines of the industry have been changed so rapidly since its beginning that all the earliest cars would be regarded as freaks if they were to be operated on Fifth Avenue, even assuming that they have the mechanical ability to appear in stylish company. As a broad proposition, the cars made prior to 1905 have no appreciable place in New York motordom. There are a few veterans of 1906 that are still in active use, but the year one as far as New York is concerned may be located about 1905. The 1907 vintage is considerably greater in point of numbers; that of 1908 is still greater and 1909 is represented by a goodly delegation. But of the 40,000 cars used in New York over half are span, brand new each season.

Like millinery, last year's car is not what might be called popular among a certain important element of the buying public. The current model is the only car Milady really enjoys driving in on Fifth Avenue. The car that gave her a sense of distinction in 1910 is a doubtful proposition to her at the best in 1911, despite the fact that it may be every whit as useful from the viewpoint of service as the latest phase of the motor art in which she finds satisfaction to-day.

This is one of the reasons for the tremendous new car trade in New York and is also a main factor in the enormous problem placed before the trade of disposing of second-hand cars.

The process by which youth and strength are maintained in an automobile is an elaborate and detailed bit of machinery.

When the Time Arrives for "Overhauling," System Should Govern the Work

The big, costly cars are supposed to run 15,000 miles or more with nothing more than adjustments, tightening of nuts and minor repairs that come within the province of any good chauffeur. But the companies recommend that they be inspected at least once a year and placed in first-class condition if anything appears to be amiss. Overhauling generally is not required before the end of the second season. The fitting of new parts for those that are worn is a delicate process, because if several of the affiliated parts are equally worn, it is a pretty problem to replace one of them with a new part so that it will act in a satisfactory manner in conjunction with its worn brothers. This, however, is done and the results obtained are apparently all that they should be under the circumstances.

The car is taken to the shop when the time for these periodic renewals arrive and the body is raised from the chassis; engine dismantled to the last bolt; transmission, gearset and axles are removed and disassembled; wheels are removed and separated into their component parts and the frame is taken apart.

Every portion is carefully examined for traces of wear or breakage and then the replacements are made and the car reassembled. It requires the labor of one man for from 200 to 500 hours to accomplish this work upon a single car and usually takes about three weeks, with three men on the job all the time. The aim of the service departments is to put the car into action on an even basis with that of new cars.

The moderate-priced cars, say, those selling around $1,500, are not susceptible to an overhauling that costs as much as their original price. It would be cheaper for the owner to buy a new car than to spend an equal amount in having an old one repaired, and still the moderate-priced automobile needs repairs. Several of the concerns in that line undertake to overhaul a small car for as little as $300 and even less in the case of small runabouts and touring cars. If such an expense is undertaken, say, every two years, the annual cost of this service would be $150 a year, which, if it includes all the repair work, cannot be considered an excessive per month cost.

It is estimated that 11,000 big cars are overhauled each year in New York and that the average cost is about $500 per car or $5,500,000. The cars represented in this number must of necessity be the most expensive among those numbered among the possessions of metropolitan motordom. The smallest cars have no place in this calculation, as the overhauling charges would go beyond the limits of economy at $500 for a car.

It is perfectly justifiable for the owner of an expensive automobile to protect his investment and insure the running of his automobile, by spending $500 for overhauling whenever his car requires it, providing it does not require it too often. Whenever he feels that the limit has been reached it is time for a new automobile.

With regard to the smaller car it may be said with assurance that the art has developed to such a stage that careful handling and a sane conception of speed

Fig. 6—In the Fiat spare parts department indicating the provision that is made to care for the wants of the customers.

will prove very effective in keeping down repair bills, which would be out of proportion to the original cost of the automobile. The general theory is advanced by many persons in the trade that the car of moderate price, personally operated by the owner and his family, needs less repair work than the more costly car which is driven by a chauffeur. The problem has several phases. In the first place the moderate-priced car does not afford the broad basis of initial cost of the other and so expensive repairs upon it are out of the question. In the second place the owner is less likely to try his car with excessive speed than the man who does not have to foot the repair bills. It is the speed that kills. Where a car can be driven at twenty-five miles an hour upon a smooth boulevard without appreciable effect upon mechanism a speed of fifty miles an hour would soon reduce the car to a heap of junk.

Moderate speed in an automobile of high class and price, theoretically, at least, would have the effect of putting off the day for overhauling indefinitely. In the cheaper car the same care as to excessive speed would serve to lengthen the life of the car without overhauling, particularly the kind of overhauling that costs $500 or more.

Another reason for the longevity of personally driven automobiles is that the owner is not at all likely to have unnecessary repairs made and naturally will not seek to find a cause for shopping his car. The absence of a chauffeur from the moderate-priced car means so much less weight for it to carry and so much more carrying capacity.

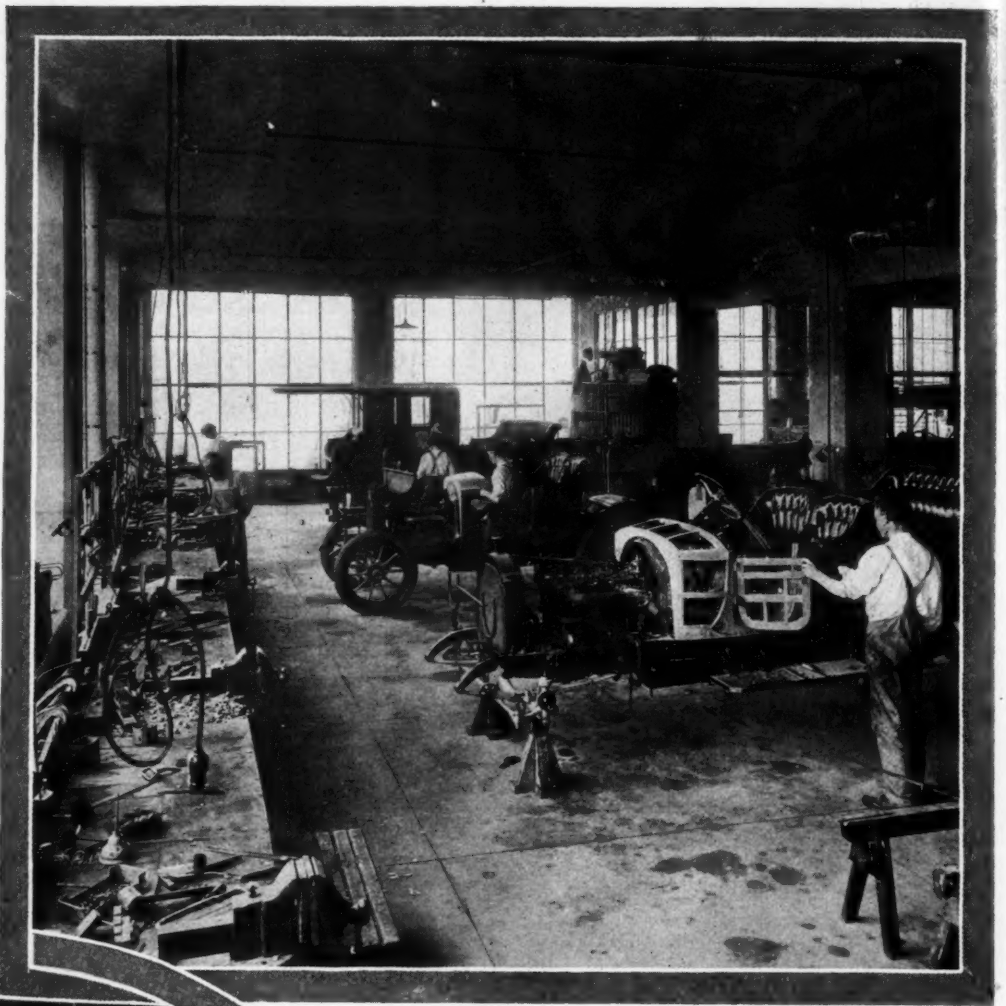


FIG. 8—PUTTING MODERN BODIES ON PACKARD CARS OF EARLIER TYPES

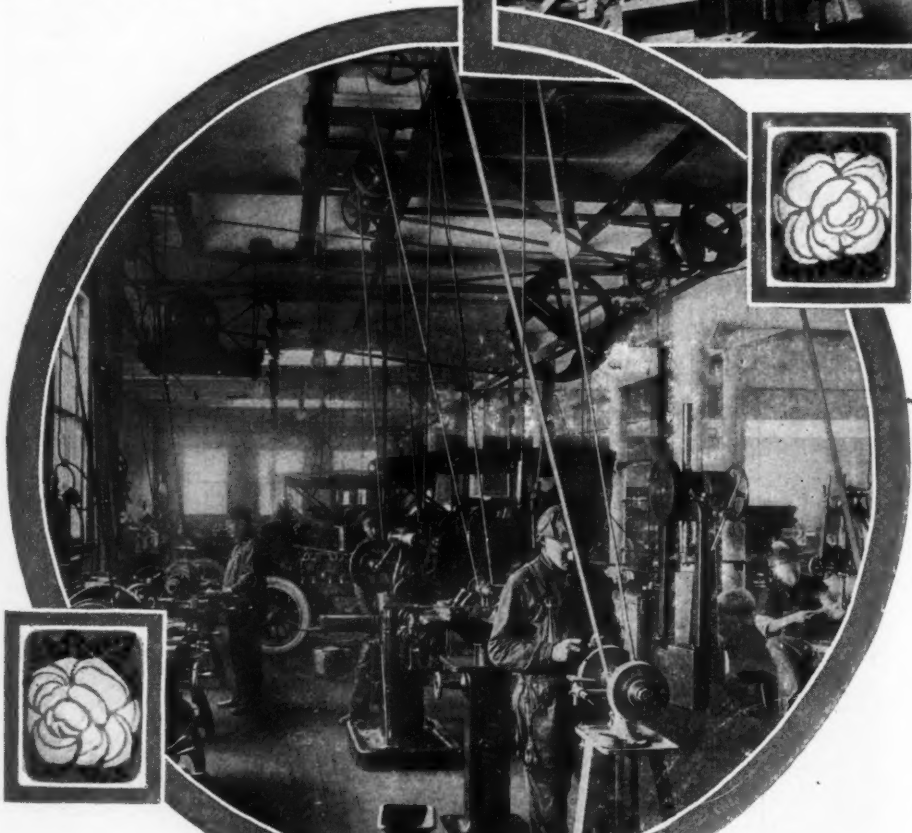


FIG. 7—WINTON MACHINE SHOP, SHOWING PART OF EQUIPMENT FOR HANDLING REPAIRS

Moderate speed, light loads and adequate care are the three essentials to long life of the moderate-priced car, assuming that its construction, materials and designing are correct. Moderation and care also render the operation of a big car less expensive and more satisfactory.

The actual cost of extensive repair work has led a large section of New York motordom to conclude that the moderate-priced car should be run as far and as long as it can be without radical repairs and then it should be sent to the scrap-heap. With good care, adjustments when needed, replacements when required and moderate speed this practice should result in excellent mileage and much satisfaction.

The biggest item of expense that applies to every man who owns a car is his tire bill. Eight shoes and twenty tubes is not far from the average consumption of an automobile in New York. The

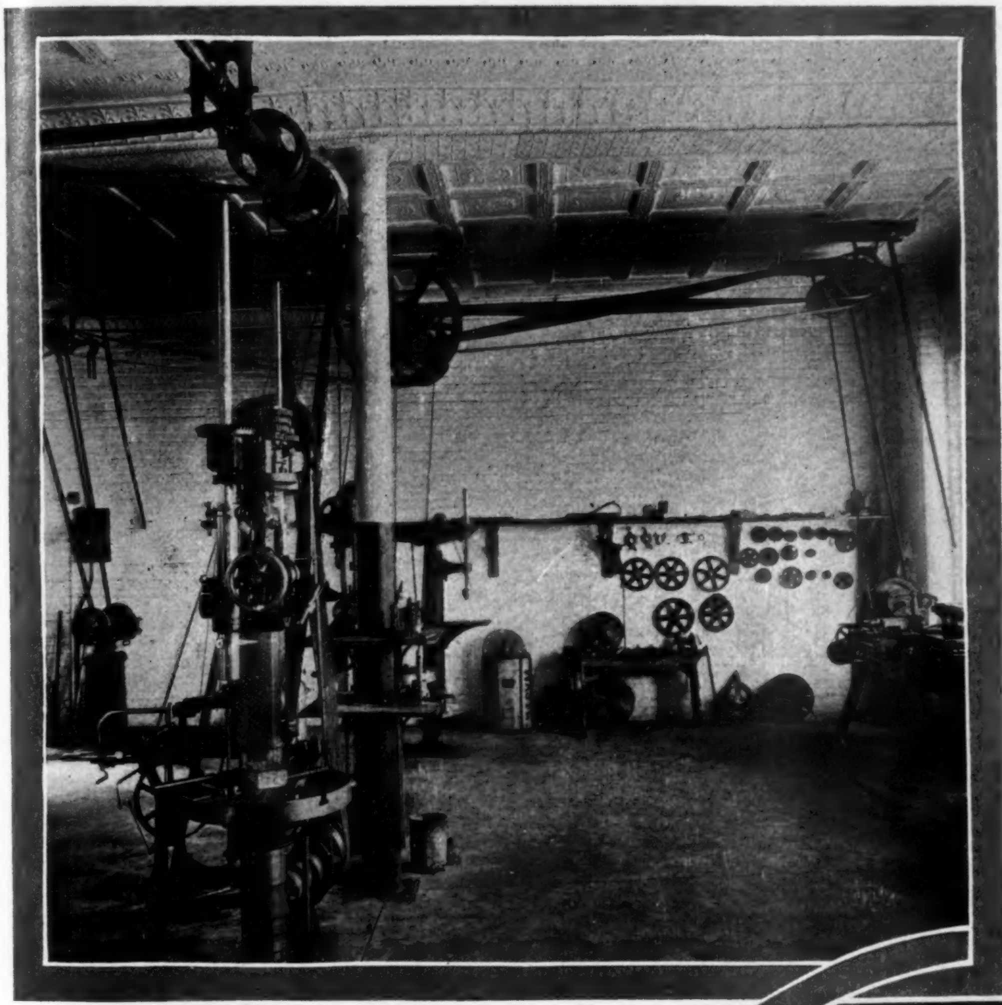


FIG. 9—MACHINE SHOP OF THE WASHINGTON BRIDGE GARAGE ON WASHINGTON HEIGHTS

pavements are in execrable condition. It is said that Fifth Avenue is the most costly bit of road in the world upon which automobiles are operated the year round. Like every other street in the city it is dotted with a particularly virulent variety of "chuck-holes." Taking up the disadvantages of travel on the New York streets, particularly Fifth Avenue, the first, of course, is the terrific strain to which the mechanism of the automobile is subjected on account of congested traffic. The short stopping and jerky starting irritate the soul of the motor car. Transmissions, clutches, gears, drives and motors are sharply tested in every block and the car that can average twenty miles a day on Fifth Avenue is certainly entitled to rank as a "sterling performer."

Naturally enough, speed does not enter into this classification of trials and tribulations. The exactly built and fitted automobile that costs $5,000 may not show much effect from this treatment in a week or a month, but in a year or two, no matter how sturdy it may be, Fifth Avenue will put it in the "service" department. The $1,000 car avoids this trouble by keeping out of the big show, but it runs into another difficulty in that it is obliged to traverse streets that are infinitely worse than Fifth Avenue in the matter of "chuck-holes."

The effect of passing over these bad pavements is divided into several phases. It jars the mechanism of the car unduly; it is painful and uncomfortable for those who ride and it has about the same effect upon tires as might be produced by a tack-hammer in the hands of a child upon its father's $400 repeater. The holes, particularly those in asphalt, have a sharp edge and after the car has jolted into one of them and given the frame, motor and transmission a wrench the car bumps against the sharp edge and by main strength yanks itself out of the hole.

The impact upon the tire places a terrific strain upon the fabric of the shoe and while there may be no blow-out at the time, sooner or later the elastic body of the shoe will become separated from the cotton webbing.

New York motordom pays dearly for the rotten streets in three ways entirely aside from the money wasted.

There are several factors in the maintenance and operation problem that will be eliminated with time and apparently time alone will have to cure them. The man who has his car overhauled when such an operation is unnecessary adds to the sum total of the cost of maintenance almost to the extent that the man does

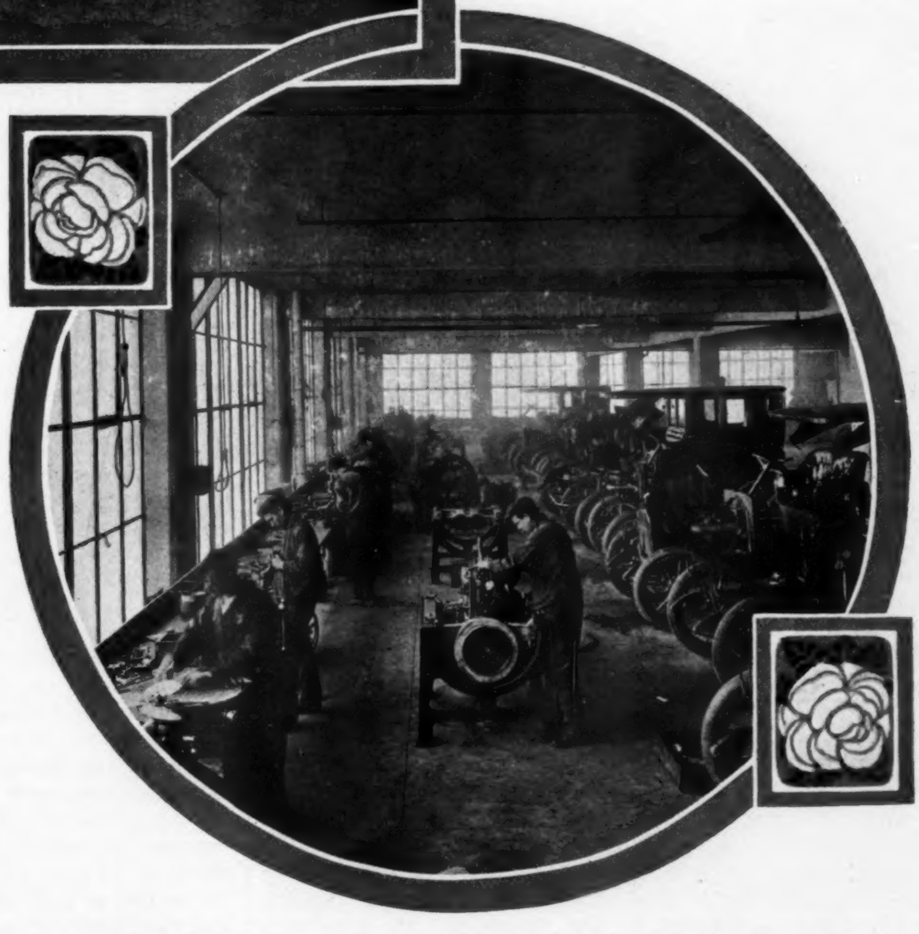


FIG. 10—OVERHAULING A LINE OF PACKARDS IN PREPARATION FOR SPRING ACTIVITY

Fig. 11—Washington Bridge Garage, showing the work of taking a car apart in the process of repairing the same.

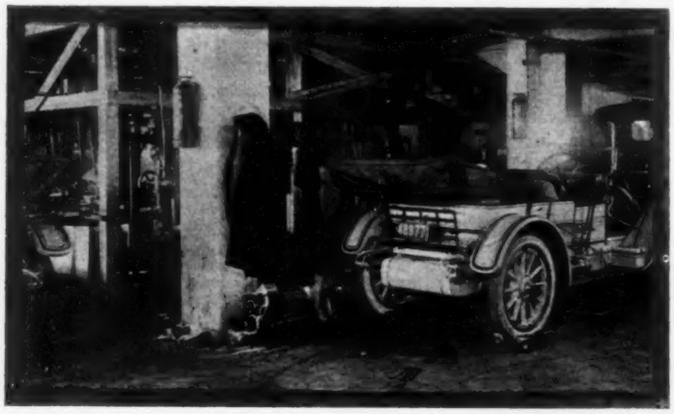


Fig. 12—Service department of the F. B. Stearns Company, showing the cars accumulating for a brisk spring overhauling

who fails to have his automobile overhauled when it is needed. With repairs the situation is somewhat different. If a crankshaft breaks it must be repaired or replaced before the car can be used. If the carbureter is out of adjustment the owner or chauffeur, as the case may be, has a simple necessary job to perform. A loose nut or two may lead to a general dissolution of the automobile fabric if they eventually work off, but like the rattlesnake such a thing gives its own warning to the observant operator. When the car needs repairs it does not keep that fact hidden and, like conscience, its voice of protest should be heeded.

The Problem of the Second-Hand Car Is One That Constantly Confronts Owner and Dealer Alike. Some of the Plans to Meet the Situation

Another vital problem in the matter of maintenance is the one propounded by the second-hand car. It is a mixed-up puzzle at present. Suppose that a man has a car that cost him $5,000 in 1910. His wife wants to keep up with the procession and he agrees with her. That spells one new automobile if the situation turns on the single point. Now the owner of the car learns that the company from which he purchased the car will allow him, say, $3,000 on the purchase of a new car. Another concern may bid $3,500 in order to sell one of its automobiles and a third may say $4,000 if the car is in first-class condition and standard in every respect. Still another may say $2,000 and another is likely to decline to make any allowance whatever. This creates a mixed impression upon the mind of the owner as to the value of his 1910 car and after going over the whole situation he is as likely as not to order his old car into the service department for overhauling with the idea of using it at least one more year.

Two plans of disposing of used automobiles are being discussed along Gasoline Row. The first of these is for the formation of a binding agreement of all the dealers to refuse to make any allowances for old cars taken in exchange. The situation then would be that the used car may be shopped and overhauled at the expense of the owner and consigned to a dealer for sale. The amount realized from this sale may be set off against the purchase price of the new car, but it must be a separate transaction. The character of the selling agency and the guarantee of the service department after overhauling the car will enter into the

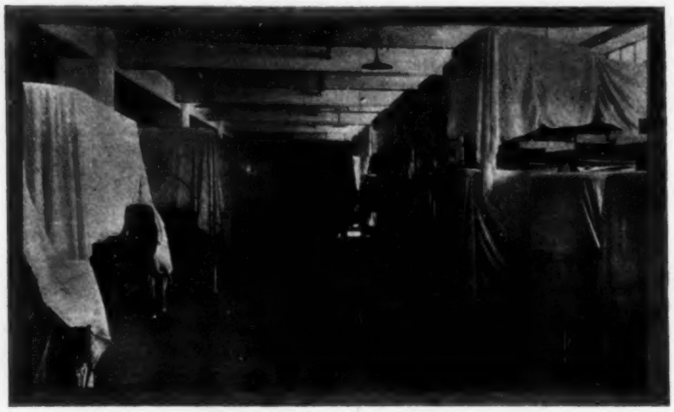


Fig. 13—In the Packard service department, showing how the automobiles are covered during the period of storage.

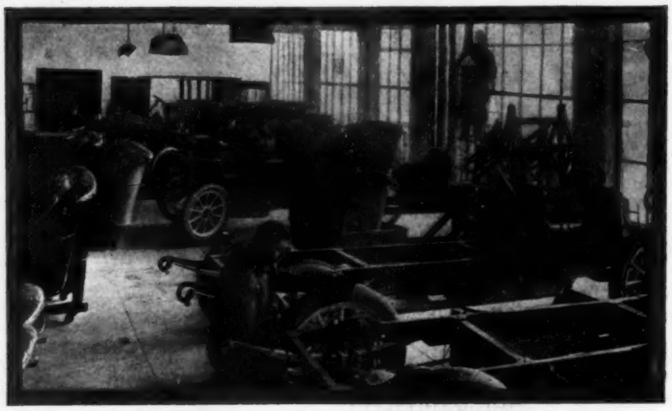


Fig. 14—Repair shop of the Packard service department, presenting the stripped chassis in process of repair

problem to a much greater extent than ever before under these conditions.

The other plan now attracting attention is to allow a flat rate for the models of each year, revising the rate sheet at the beginning of each selling season. This also has many strong advocates among the dealers and is manifestly much fairer and more equitable than present practice. It gives, however, a basis of valuation that may be either fictitious or unjust.

A view of the general figures resulting from a careful investigation of the cost of operating an automobile in New York leads to the conclusion at first blush that Father Knickerbocker is paying a high figure for his motoring. But a little closer inspection shows that the old man has himself alone to blame for a considerable part of the high cost. It is safe to say that there is not a garage, machine shop or repair department in the city that has not at least one good story to illustrate the gullibility or worse of the motoring public. Here is a sample:

"I conducted one of the big garages in New York until a short time ago," remarked the head of a prominent sales organization. "Among the patrons of my establishment was the owner of an expensive automobile. We had handled the car for a year without hearing a word of complaint from the owner. The repair bills were small and the supplies furnished for the car were about the average in volume. One day last Spring we rendered a bill

to the owner for $225 for inspection, repairs and supplies and when settlement day came no check covering the amount was received.

"I said nothing and took no action and in a few days the chauffeur employed by the owner called upon me. When we were quite alone he turned to me and whispered: 'You sent a bill to the old man for $225. Why don't you make it $325 and give me $75?'

"I picked up a bale-stick and chased him out of the office and as soon as I could I went to the telephone and called up the owner.

"I informed him that his chauffeur was a thief and explained just what the man proposed to do. Now what do you think that owner said?

"He answered over the phone that he did not believe me in the first place; that if all I said was true he was not specially interested as he rather expected to be robbed anyhow; that at the worst such things were too small to be bothered about and finally that he would take his car away from my shop because he did not want to hear such things. And he did just that thing."

There is another view of the repair and operation situation that has a different angle. The vast bulk of New York automobile owners keep their cars for pleasure, health and incidental convenience that come from their operation.

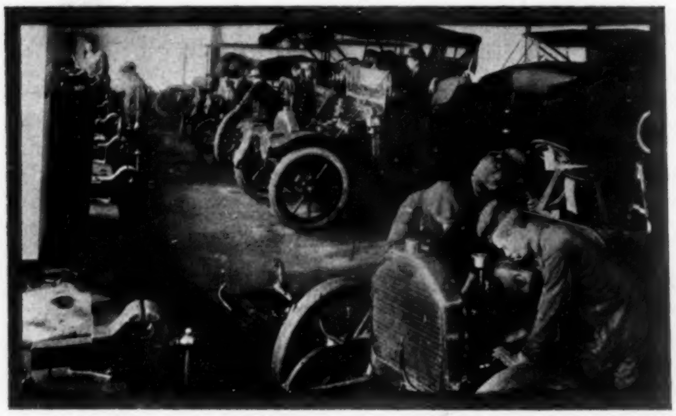


Fig. 15—Peerless repair department, indicating provision for quick and good repair work.

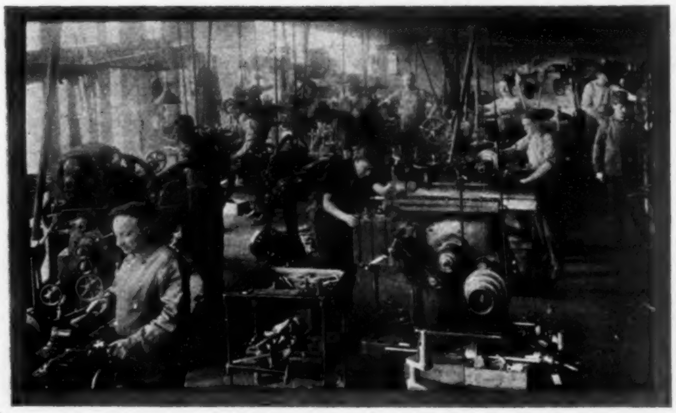


Fig. 16—Fiat machine shop where the automobiles of this make are repaired and made serviceable.

Many of them point out that the recreation and enjoyment that are parts of motoring are without price. They liken their cars and their cost to social entertainment and wish to keep away from cost figures to exactly the same extent that a man would who is giving an expensive dinner to a number of guests. If the bills for the dinner are constantly under his nose he loses much of the pleasure of giving.

Happily for the industry this class is not of sizable importance in comparison with the whole, but it does constitute an element that should not be overlooked.

It sets a pace of extravagance that acts like leaven to the whole lump. Almost all pleasure cars have pleasure, health and convenience for their three main recommendations and the man who takes no note of expense has already cost the others a pile of money.

The Value to the Owner of Health, Appetite, Fresh Air and Enjoyment Cannot Be Expressed in Mere Dollars and Cents

As a general thing health is priceless and the fresh air, fine appetites and improved co-ordination that come to users of the motor car cannot be reckoned in terms of money. But the average user of the automobile only wants to pay a reasonable amount for his added comfort through the car and it is upon him that the solution of the problem of expense rests.

When the value of the second-hand car is established and when the models of standard cars are carried along from year to year with only minor changes and when the system of repairs is further developed and equalized, then the cost of operation, maintenance, upkeep and so-called depreciation will be lessened materially and the whole atmosphere in which motordom lives will be cleared.

Every month witnesses the approach of these conditions. Every step forward that is taken in the direction of scientific system brings them closer. Each refinement in method has its purpose and it is confidently predicted that in a reasonably short time the various elements involved in the problem propounded by the automobile will come together in a compact body and solve the puzzle of excess, extravagance, penuriousness and ignorance as they apply to the matter of running a motor car.

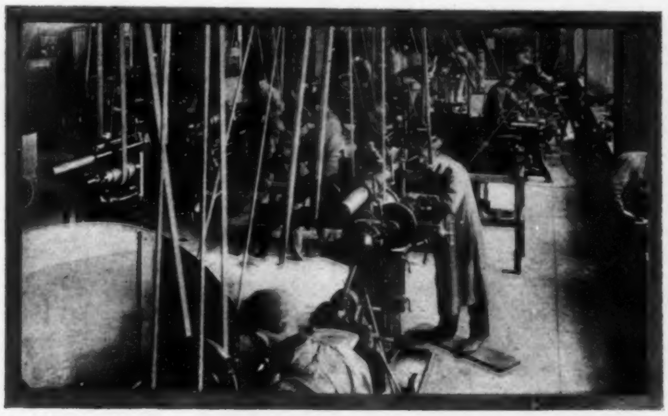


Fig. 17—Brewster machine shop, used in the repair of automobiles, employing eighty men on repair work.

Fig. 18—Marmon provision for service to the users of this make of automobile.

Conventional Brake Calculations

By William D. Ennis, M. E.

In view of the importance of brakes from the safety and control point of view, William D. Ennis, Professor of Mechanical Engineering, Polytechnic Institute, Brooklyn, makes an analysis involving coefficient of friction, the relation of adhesion and weight, and discusses the limitations due to gradient, and by a series of problems in logical array, a clear conception of the requirement is offered. The values of different facing materials are given weight.

WHEN, as in Fig. 1, a body B moves on a surface ss, pressing on the latter with a force W (usually the weight of the body) a resistance to motion is experienced. If we call this resistance F, then the ratio

$$c = \frac{F}{W}$$

is called the *coefficient of friction*. If the surface is a hub or axle on which the weight is applied by a fitted shoe, as b, Fig. 2, the same definition holds. The force F now opposes rotation and is applied tangentially to the circumference of the hub. If a frictional resistance of F lbs. is exerted on the hub of a wheel of diameter D, as in Fig. 3, then by the principle of levers

$$f = \frac{d}{D} F,$$

f being the equivalent resisting force at the rim of the wheel. We readily find

$$f = \frac{d}{D} cW. \qquad (1)$$

Values of c are as follows:

for cast iron on cast iron, 0.10 to 0.15,
for cast iron on paper, 0.15 to 0.20,
for cast iron on leather, 0.20 to 0.30,
for cast iron on wood, 0.20 to 0.50.

In general, the value increases somewhat as the rubbing velocity increases.

Automobile Brakes

Braking in automobiles is rarely accomplished by direct pressure of a shoe against a tire, although this method would be allowable if ample contact surface were provided. The brake is usually a circling band on an axle, hub or the case of the differential. It may be drawn against the outside or expand against the inside of any revolving cylindrical surface. A brake drum may be from 8 to 24 inches in diameter. The band is usually of metal faced with leather, sometimes of metal alone, sometimes with a facing of camel's hair or asbestos, both of which are comparatively unaffected by heat. The contact surfaces are usually not intended to be lubricated.

If a total brake pressure of W lbs. is applied to a hub of diameter d directly on the wheel axle, the wheel diameter D and the coefficient of friction c, then equation (1) gives the value of f, the retarding force exerted at the tire. It is this force which stops the car.

Adhesion

Let us disregard brakes for a moment. In Fig. 4 if a weight of W_o lbs. is communicated to a surface through a wheel, then, no matter how much the friction between wheel and surface, the force F retarding movement in the direction indicated cannot exceed W_o lbs. If a greater force than this is applied to produce forward movement, the wheel will not only turn, but it will slip along the surface toward the right. Now, in point of fact, F cannot even be equal to W_o, if the coefficient of friction of the wheel on the surface is C, $F = CW_o$ is the maximum condition. The factor C in this connection is sometimes called the *adhesion* or *factor of adhesion*. When we retard a rolling wheel by a tangential force f, if this force be allowed to exceed CW_o, adhesion will be overcome and the wheel will slide along the surface of the ground. With certain conditions of the surface the car would thus soon be brought to a stop; but such sliding would be uncontrollable and dangerous as well as destructive to the tires. The equivalent braking force f must then not exceed CW_o.

Automobile Adhesion and Weight

The coefficient of friction of inflated rubber tires on an average dry road is stated to be 0.60. This, then, is our value for C. The symbol W_o is not the weight of the machine, but only that proportion of the weight which is carried on the wheels to which brakes are applied; say, as an example, $W_o = 0.60 \times$ (W' = total weight of car). If we take these values, f must not exceed $0.60 \times 0.60 W' = 0.36 W'$. But $f = \frac{d}{D} cW$, and consequently W must not exceed

$$\frac{fD}{dc} = \frac{0.36\,DW'}{cd}.$$

If $c = 0.25$, this becomes

$$\frac{1.44\,DW'}{d}. \qquad (2)$$

With brakes applied to the tires, the maximum allowable braking pressure (since $d = D$) would then be 44 per cent. greater than the weight of the car. With 32-inch wheels, the maximum pressure is $\frac{46 . W'}{d}$, which becomes

5.76 W' when d = 8 inches,
3.84 W' when d = 12 inches,
2.88 W' when d = 16 inches,
2.31 W' when d = 20 inches,
1.92 W' when d = 24 inches.

The allowable braking pressure would obviously be increased if, as in good railway practice, brakes were applied to *all* of the wheels.

Limited Grade

In railway braking these relations lead to the conclusion that there is a conjectural limiting grade on which brakes would be useless. For our conditions, the maximum retardation without slipping the wheels is 36 per cent. of the car weight. Since the effect of the weight of the car in pulling it down a grade is about 1 per cent. of the weight for each per cent. of grade this downward pulling force would just equal the maximum useful retarding force on a 36 per cent. grade. At any steeper grade than this the wheels would slip. Spectacular feats might be

accomplished by braking all of the wheels. In ordinary practice, a 36 per cent. grade with a 3000-lb. car would require 1080 lbs. tractive force—not often provided—so that there is little danger, ordinarily, of getting the car on a hill where the brakes will not hold it.

Ice on Hills

The writer had one experience of slipping on a short steep incline coated with a film of ice. The brakes would not hold because the value of C was far below 0.60. For the same reason, the motor could not haul the car up the hill, the available tractive force being limited to CW_0. The difficulty was finally overcome by spreading brush, blankets and overcoats before the wheels. This increased C, and the car took the hill on second gear.

Slipping and Skidding

There are many road conditions under which the wheels may be locked by application of even, properly designed brakes; fortunately, however, a great variation in pressure applied is possible to the operator. Locked and slipping wheels, of course, damage tires, besides making the car uncontrollable. Skidding (the movement of the wheels sidewise) is due to the occurrence of lateral forces—centrifugal force when turning a corner, or some peculiarity in tire grip. It occurs so easily on wet pavements or muddy roads that the coefficient of friction between tire and such a surface must be extremely low.

If an automobile wheel slips on ice when the tractive force is 100 lbs. per ton (an ordinary tractive force at high gear), 60 per cent. of the weight being on the rear wheels, the coefficient of friction cannot exceed

$$c = \frac{f}{0.60\,W'} = \frac{100}{0.60 \times 2000} = 0.0833.$$

Skidding from Centrifugal Force

When a car weighing W' lbs. rounds a curve of r ft. radius at a velocity of v ft. per sec., the radially outward centrifugal force may be found by the expression

$$F' = \frac{W'}{32.2} \cdot \frac{v^2}{r}. \qquad (3)$$

Suppose the car to weigh 2000 lbs., to be moving at 20 ft. per sec. (13½ miles per hour) and to skid when turning a curve of 60-ft. radius. Fig. 5 shows the condition of things. The rear wheels are moving in the direction indicated by the force arrow F', the moving force being

$$\frac{2000}{32.2} \cdot \frac{400}{60} = 415 \text{ lbs.}$$

The weight on the rear wheels being taken at $0.60 \times 2000 = 1200$, the coefficient of friction for skidding is

$$C' = \frac{415}{1200} = 0.345.$$

Let the machine weigh 3300 lbs., and let the wheels be 34 inch, the inside diameter of the external brake band 11 1-3 inch, $c = 0.25$, and two-fifths the weight of the car on the rear wheels. The maximum allowable value of f is

$$0.40 \times 0.60 \times 3300 = 792 \text{ lbs.}$$

The corresponding value of F is

$$\frac{34}{11\ 1\text{-}3} \times 792 = 2376 \text{ lbs.,}$$

and the maximum allowable force on the band is

$$\frac{2376}{0.25} = 9504 \text{ lbs.,}$$

which could be applied by a 50-lb. foot-lever pressure if the brake lever ratio were $9504 \div 50$, or about 190 to 1. The corresponding movement of the band could then not exceed $\frac{1}{190}$ the movement of the foot lever.

Brakes and Clutch

If the brakes are needed suddenly they should not be required to overcome the forward effort of the motor as well as that due to the momentum of the car. Moreover, the motor should not be strained by allowing the brakes to be applied while it is in gear. For this reason, the foot lever and clutch are attached, so that when (or a little before) the brake is applied the clutch is automatically thrown out. The emergency brake will be arranged to give a chance for powerful pressure and ample swing. It may be locked so that the car can be fixed in position when left for a few moments. There is an element of danger in allowing the emergency brake to be connected like the foot brake with the clutch. If the car has been stopped on a hill, the brake must then be thrown out before the clutch can be thrown in, and a little carelessness or delay would start the car backward.

Compression Braking

The braking surfaces wear rapidly and to avoid burning the brakes should be applied in a series of impulses rather than continuously On a long down grade, a considerable retarding force (50 lbs., perhaps) can be applied by merely meshing the gears and cutting out the ignition. This 50 lbs. would bring a 3000-lb. car to a standstill on a 1 2-3 per cent. grade. Any supplementary braking—and this is true of brake applications in general—will be most effective if the heaviest pressure is suddenly applied and then allowed to gradually decrease, for the coefficient of friction c decreases as the velocity decreases, and the allowable total pressure decreases as c decreases, if slipping is to be avoided. Sudden and powerful first application is, moreover, the usual condition of safety.

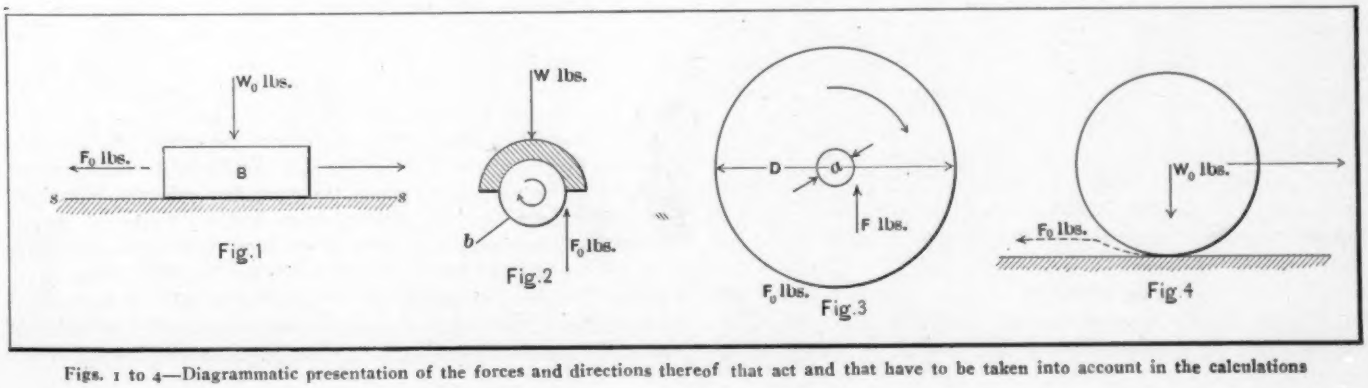
Time of Stopping

From the expression,

$$\text{force} = \text{mass} \times \text{acceleration},$$

$$f = \frac{W'}{32.2} \cdot \frac{V_2 - V_1}{t}, \qquad (4)$$

we may find the time t in which the velocity will be reduced



Figs. 1 to 4—Diagrammatic presentation of the forces and directions thereof that act and that have to be taken into account in the calculations

from V_2 to V_1 feet per second. Also, if s be the distance covered while this reduction in velocity is effected,

$$s = \frac{V_2 + V_1}{2} . t$$

$$f = \frac{W'}{32.2} . \frac{V_2^2 - V_1^2}{2s} . \qquad (5)$$

If the car is to be finally brought to a stop, $V_1 = 0$ and these equations give

$$f = \frac{W'V_2}{32.2t} = \frac{W'V_2^2}{64.4s} . \qquad (6)$$

Take a 2000-lb. car, of which 1200 lbs. is on the rear wheels, $C = 0.60$; and let it be required to find the distance in which the car, moving at 20 miles per hour, may be stopped at maximum allowable brake retardation. This retardation will be

$$0.60 \times 1200 = 720 \text{ lbs.} = f. \quad \text{Also } V_2 = \frac{5280 \times 20}{3600} = 29.2 \text{ and}$$

$V_2^2 = 854$.

Then

$$720 = \frac{2000 \times 854}{64.4s}$$

and

$$s = 36.6 \text{ ft.}$$

The necessary braking force to accomplish a stop in a given distance is therefore proportional to the square of the initial velocity.

Effect of Resistances

The retarding force is, however, not precisely that exerted by the brakes. At 20 miles per hour the head end resistance of the car is about 25 lbs.; friction is about 50 lbs. more; and these resistances alone would bring the car to rest in a few hundred feet. On an up grade the resistance of the grade (1 per cent. of the car weight for each per cent. of grade) would also help; it would take (in the present illustration) a grade of $\frac{720}{20} = 36$ per cent. to be equal to the effect of the brakes in bringing the car to a stop. On a down grade, the brakes are not helped, but hindered by the grade; in the illustration just given, the value used for f would have to be reduced by an amount sufficient to cover the effect of the grade. The maximum retardation may not exceed 720 lbs.; if there is a down grade of 6 per cent. it will overcome 120 lbs. of this retarding force, and the distance covered in making the stop will be increased to

$$\frac{720}{720 - 120} \times 36.6 = 43.92 \text{ ft.}$$

Illustration

Take a 2000-lb. automobile to which a brake retardation of 700 lbs. is imparted while the speed is 60 miles per hour on a 2 per cent. down grade. The head end resistance is at 60 miles per hour about 225 lbs.; but this steadily decreases and the mean is perhaps not over 1-3 of this, or 75 lbs. Friction may be taken at 50 lbs. more, giving auxiliary resistances of 125 lbs. Of this, 40 lbs. will be offset by the grade, leaving 85 lbs. to be added to the brake effect, so that the total retarding force is 785 lbs.

$$\text{Then, since } V_2 = 60 \times \frac{5280}{3600} = 87.8, \; V_2^2 = 7700.$$

$$785 = \frac{2000 \times 87.8}{32.2 \times t} \quad \text{and } t = 6.91 \text{ seconds,}$$

$$785 = \frac{2000 \times 7700}{64.4 \times s} \quad \text{and } s = 304 \text{ ft.}$$

The car will thus be brought to rest in 304 ft., which would require nearly 7 seconds.

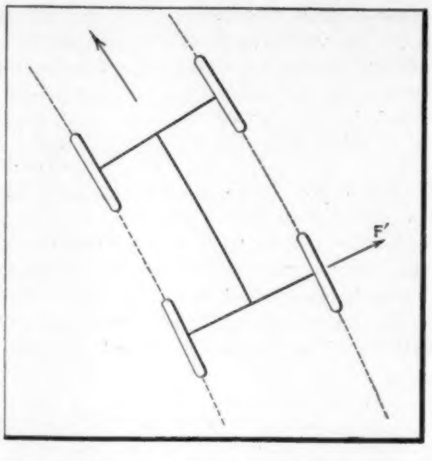


Fig. 5—Diagram of a car on a curve used to illustrate a point in the calculations

A 3000-pound car has 50 per cent. of the weight on the rear wheels. The brake band is faced with leather and works on a 16-inch hub. The wheels are 32 inch, the leverage ratio between operator's foot and brake band 30 to 1. Required (1) the maximum allowable retardation without slipping, and (2) the pressure to be exerted on the foot lever if the car, moving at 50 miles per hour on a 1 per cent. up grade, is to be brought to a stop in 300 feet.

We will assume the coefficient of friction at the brake band to be 0.25; that at the tires to be 0.60; frictional resistance of machine, 50 lbs.; mean head end resistance during the stop, 52 lbs.; grade resistance, 30 lbs.

The maximum allowable retardation without slipping is

$$0.50 \times 0.60 \times 3000 = 900 \text{ lbs.}$$

If this is to be applied at the tires, the retardation at the brake hub must be

$$\frac{32}{16} \times 900 = 1800 \text{ lbs.}$$

The brake band pressure must be

$$1800 \div 0.25 = 7200 \text{ lbs.,}$$

and the maximum pressure on the foot lever is

$$7200 \div 30 = 240 \text{ lbs.,}$$

which there is little or no danger of reaching.

To stop the machine under the conditions assigned requires the retarding force (Equation 6),

$$f = \frac{3000 \times 5320}{54.4 \times 300} = 828 \text{ lbs.}$$

Head end, grade and machine resistances provide 132 lbs. of this, leaving for the brake $828 - 132 = 696$ lbs. Comparing this with the former ratio,

$$240 . \frac{696}{900} = 186 \text{ lbs.}$$

is the foot lever pressure to be exerted.

Slow Traveling the Best Remedy.—Whenever the road is inclined to be treacherous, slow traveling is the best remedy against side slips and skids. The autoist should avoid using the brakes at all if possible and this he can do only by concentrating his attention on the road at a much greater distance ahead, as regards speed, than is his usual custom. If a turn is to be made, or if the brakes have to be used he should take advantage of dry spots or any camber favorable to his purpose, as it is frequently possible to choose to some extent the exact course that is taken. For example, if a pull up or considerable reduction of speed will be necessary within the next few minutes, a lookout should be kept for less slippery spots which may be of service or at the least choose a portion of the road where the conditions are no worse than that over which the car is progressing at the time. The same thing should be done if a turn of any nature has to be made under the same circumstances. The risks of side slip can thus be reduced, if not altogether eliminated.

Items From Foreign Lands

Interesting extracts, mainly from the United States Consular Reports, in which the status of the automobile in foreign parts is tersely set forth, and the prospects of extending the American market are called to the attention of those interested.

SPAIN has a town named Jerez, with a population of 50,000. The manufacture of wine and brandy constitutes their chief industry. Neither is there a shop here in which automobiles are sold, nor would it pay to keep such a shop. And yet there are 22 automobiles owned in Jerez. These comprise one of the Spanish-Swiss make, two English, five Italian and 14 French. The gauge used is in the main 51 1-2 inches, although it varies from 35 1-2 to 77 1-2 inches, according to the automobile. There are two agents in Jerez, but neither one sells American machines. Both of these agents have manifested a willingness to look into a proposition for handling American-made cars, although one understands English and the other does not. The sure way to express weights is in kilos. It is proposed by one of the agents that an automobile passenger service shall be established between Algeciras and San Fernando, a distance of 58 miles, the latter place being a short distance from Jerez. The roads are fairly good, although there are several hills.

Russia is going in for automobiles for use in the army. The government has already placed her orders for the coming year, but it is said that she will be in the mood of buying more machines in 1912. The largest number of orders heretofore have been picked up by France, the Italian, English and German manufacturers, respectively, following next in order. Three-ton military cars and the light one-and-one-half-ton cars are the two types of automobiles needed. There is every likelihood that the automobile business in Russia will develop into splendid proportions. There are reasons; railway service is inadequate; there is a fine opening on account of the need for additional postal facilities, and the price of fuel is far below that of any other European country. Russians demand strong, heavy machines. This is one of the causes of the dearth of American-made machines in the Czar's dominions. While American-made cars are strong, the Russian has not been led to think so. Agents should speak the tongue of the country and be familiar with the temperament of the people.

S. F. Edge, commenting as one who has been over the ground, says that he has visited the United States and has learned that "ten times more people in America could afford motors than in this country. Roughly speaking there are about 15,000 motor cars manufactured in this country (England) in a year and about 200,000 in America and the surplus cars that America does not want are shipped to countries like England and practically sold for what they will fetch. If the similar models of those required in England were the current requirements in America we should be face to face with the fact, owing to the larger American market, plus the addition of the further British market, that the American manufacturers could outsell us every time over there and completely eliminate the British motor industry."

So far as his city is concerned, the Guatemalan is a person of progress. He is digging up the cobblestones in the streets and replacing them with flagstones. This act of public service has lightened the hearts of the people who can afford automobiles. The consequence is that one is able to count forty automobiles in Guatemala. Thirty of these, mainly of the cheaper grade, were manufactured in America. The costlier machines, fetching about $4,000, were made in France. Bicycles are in vogue. The number of motor cars is limited. There are no rubber-tired trucks used.

The city streets in Tampico, Mexico, are being paved with the view to the influx of automobiles. It is predicted that a generous market for automobiles will open here. A number of firms are introducing wagons for delivery, while citizens are sending for carriages and automobiles. Just recently one of the oil camps near the city purchased a large automobile truck.

The Turin, Italy, Exposition, which opens on April 20 of the present year, will make a great feature of automobiles. Already the United Kingdom is making ready for the exhibit, the organization of the British motor section being in the hands of The Society of Motor Manufacturers and Traders.

The colony of Netherlands, India, according to the latest statistics published (1909), imported 448 automobiles valued at $627,-568 during the year. Of this number, 51, worth $65,600, were manufactured in the United States; the Netherlands made 330, worth $424,380; France made 30, valued at $38,580; while 28, worth $36,008, were made in the United Kingdom. During the same year Netherlands, India, imported $175,000 worth of bicycles, of which $1,800 worth (an increase of $800 over 1908) were of American make, the remainder having been made in the Netherlands, Germany, and the United Kingdom.

Effect on Quality in Forging Steel

By E. F. Lake, M. E.

Dealing with the problems of forging of steel from the point of view of the builder of automobiles, relating the differences that exist between the generic types of forgings, illustrating the results obtained in the several ways, indicating the short-comings of some of the methods, pointing out the way by which difficulties may be overcome, leaving it to the manipulator of the steel to obtain the best result at the lowest cost.

THE forging of steel is of great importance to the automobile industry. Many parts that enter into the construction of a car are of such an irregular shape that to obtain the necessary strength with a reasonable degree of lightness forging is resorted to. In attaining these results the parts can be produced cheaper than by any other method. While forgings are made in several different ways, they might be classed under two main heads, *i.e.* hammer forgings; in which the pieces are heated and pounded into shape by a hand or power driven hammer, and forgings that are formed to shape between two parts of a metal die.

While the term drop-forgings has been pretty universally applied to this latter form, it should by right be divided into three classes. The first are rightly named drop-forgings, as they are made by dropping one part of a die onto a piece of heated metal held over the other part and thus forcing it into the depressions sunk into them. The second should be called hammer forgings, as the upper part of the die is moved by steam or other power that causes the upper part of the die to strike the metal a series of blows. This hammers the piece into the depressions cut into the two parts of the die. The third kind should be called pressed

forgings. In this the hydraulic or pneumatic press is used and the piece is squeezed, instead of hammered, into the die's depressions.

The first two of these methods produce forgings that are practically alike as it is immaterial whether the blow is struck with a falling weight or whether there is power put behind the die to strike the blow. The latter of the three produces forgings that differ from the two former, owing to there being exerted upon the metal a steady pressure, rather than sudden blows. All three could rightly be termed die-forgings to distinguish them from the hand formed piece, whether made with a hand or power driven hammer. A two-throw crankshaft weighing 400 pounds has been die-forged, commercially, with a steam hammer for the past three years, and this is doubtless the largest forging that has been made in metal dies.

The first class, or the hammer forgings proper, are used very little in automobile work as where many duplicate parts are to be made, it is much cheaper to forge them between dies. When forgings are properly made and heat-treated, the parts thus made are stronger than when made by any other method. When the work of forging and heat-treating is not properly done, however, the metal might even be weaker than steel castings.

The first and most important thing to take into consideration when making forgings, is the temperature of the metal. Many poor forgings have been made by raising the temperature too suddenly to allow the molecular changes to take place that always occur in steel while its temperature is being raised to a forging heat, or even much below it. Poor forgings are also made by not heating the metal high enough before starting the forging operations. Then the forging will be finished at too low a temperature. Many other poor ones are made by the opposite course, *i. e.*, by heating them too high and finishing the forgings at too high a temperature.

The ordinary steels, that contain a high percentage of carbon, cannot be heated to a temperature much over 1800° F. without burning the metal. To remove the effects of burning it is necessary to remelt and re-work the metal. The lower carbon steels, however, can be heated to 2,000 or more degrees and some of the alloy steels such as nickel-chrome must be heated to near the melting point.

Steels heated to forging temperatures ranging from 1,800 to 2,400 degrees would be greatly weakened from overheating, if it were not for the hammering or pressing they receive when being forged into shape. These high temperatures coarsen the grain and cause a certain degree of crystallization. The hammering or squeezing given the metal when forging reduces this grain to a finer state by forcing the molecules closer together. This strengthens the metal by creating a greater cohesive force between the molecules.

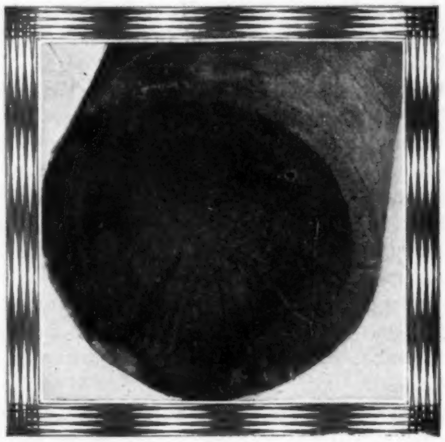


Fig. 3—Example of forging showing how the hammer produces a hard shell just as in carbonizing

The forging as it leaves the forging press has an irregular grain structure no matter by what process it is made. Although this is lessened by the pressing method, fractures that show crystalline in spots are bound to be the prevailing feature of forgings in this state. To overcome these, annealing is resorted to and when the steels are properly annealed after forging, they will disappear.

Fig. 1—Effect produced by too light hammer blows or too low a forging temperature

The appearance of a crystalline fracture, or any trace of crystallization in forgings that were properly annealed should instantly condemn them. This would doubtless mean that the metal had been burnt, and consequently weakened.

The improvements that have been taking place in the hydraulic or pneumatic presses and the development of the so-called high-speed press has greatly increased the production of forgings that are made with a continuous pressure rather than with a hammer blow. While the hammer blow is bound to produce a very uneven structure, the greater part of this can be overcome by annealing. The effect of hammer blows can plainly be seen in Figs. 1 and 2. Practically the outline produced by each blow can be traced in these bars of steel, which were broken after being forged.

In these cases either the blows from the hammer were not powerful enough to penetrate to the center, or the metal was not hot enough to allow them to do so. The outer shell of metal, which was affected by the hammer blows, was condensed to a very fine grain, while the center of the forging showed the cross crystalline structure that was produced by the high forging temperature.

The defects seen in Fig. 2 were exaggerated by imperfect heat treatment. This is a high carbon steel and is typical of what is liable to occur in any steel that is improperly forged with any kind

of hammer blows. Segregations of ferrite, pearlite and cementite appeared in this piece and crystallization in spots was plainly seen. There was also a lack of homogeneity in the structure. The piece in Fig. 1 was heat-treated properly and hence the demarkation between the effects of the forging blows and the center of the metal which was unaffected was much less prominent. It shows the same defects from hammer blows and also defects caused from unevenly cooling a high carbon steel.

In Fig. 3 is shown a fractured piece that was forged by a relatively light hammer; the effect of the forging can be seen to be quite shallow and it makes the piece look much as though it were carbonized. Part of these defects could be corrected by proper heat-treatment. They nearly always occur where the hammer is too light, or the metal not heated enough, or both. When this is the case the structure of the steel will not be affected to a depth that is sufficient to produce good sound metal of fine grain, no matter what method of forging is used. The hydraulic forging might not show the flaky outer surface that is produced in steel by hammer blows, but the lack of penetration would probably produce as poor forgings. The defects shown in Figs. 3 and 4 could easily be produced in forgings that were pressed into shape.

Fig. 4—Another example of the production of a hard shell by forging—the core is soft in comparison.

In forgings that are properly made, the metal should not be allowed to cool below its highest recalescent while being forged and the forging should be finished just as it reaches that point. At this point a new grain structure is born that makes the metal more homogeneous. This change of grain structure continues after the steel leaves the press, until it cools below its lowest recalescent. At this place it sets and no more change will take place until it is again heated to the highest recalescent point. These two points occur in most steels at about 1400° and 1650° F. Some of the special alloyed steels, however, show quite a variation from this. For this reason, as well as others, the kind of steel being forged should always be known if the best results are to be obtained. In heating steels up, ready for forging, a change of grain structure takes place at about 600 degrees F. For that reason the best result can be obtained if the metal is heated slowly up to this point, and time then allowed for this change to take place. After this the heat may be applied as quickly as desired until the steel reaches the higher temperature that makes it fit for forging. It is in the care given the steel that much of the success lies to a large extent—judgment and exact knowledge also have a place.

Causes of Valve Wear

Drivers are at fault for not examining valves more often—soot or dust is caught between valve and seat and is pressed into the latter. Some drivers grind valves as soon as a certain distance has been covered.

THERE are many factors which enter into the life of a valve seat, and in the frequency of grinding all of them have to be taken into account. Some of these are: Imperfect cooling of the seats; too strong springs, which cause hammering and thus wear out the seats prematurely; over-lubricating, which causes spitting and sooting, both of which reduce life of the valve seat.

Other causes are contributory negligence on the part of the driver in not examining them more often, which examination often results in the discovery of something in the way of soot or dust caught in between the valve and seat, and being gradually pressed into the latter. A careful driver may get four to five thousand miles out of his valves with one grinding, while another, with the selfsame car and engine, may only get one or two thousand miles per grinding.

A habit followed by professional drivers is to grind valves as soon as a certain distance has been covered, this being predetermined by experience with a single or many cars. This habit might well be followed by amateurs, as soon as they have driven enough to determine the critical mileage.

To Prevent the Loss of Wheel Caps—There are two methods of ensuring that the wheel cap will not come off once properly put on: (1) If the cap screws up flush with the metal ring of the hub a small center punch hole at the point of contact will prevent it coming unscrewed; (2) if the cap overlaps the ring, drill a hole in the ring and in the cap, tap out and place a small set screw that just comes flush with the cap. It will hardly be noticed, but may save trouble and expense later.

Fig. 2—Unequal effect of blows and not enough penetration—exaggerated by improper heat treatment.

Systematic Trouble Hunting

Continuing by Specific Cases

By a process of elimination, listing the known quantities, thus making it possible to set down the list of unknown quantities for the purpose of investigating them, it is recommended that the automobilist take up these unknown quantities in the order they are named, and, after investigation, learn the conditions as they exist, ending with the transfer from the list of unknown quantities to the list of known quantities all of the matters involved, to the end that the trouble will be located as a last resort, if not within a short time after the systematic investigation is started. System is the greatest asset in dealing with the troubles of the automobile, and difficulties may be overcome with less effort and trouble by proceeding along fixed and well-defined lines.

IN the preceding issues of THE AUTOMOBILE, dealing with trouble hunting, seven cases were cited and systematized, all of them dealing with the motor when it fails to operate. There still remain certain conditions under which the motor will fail to operate, and cases eight and nine are here given as conclusive of this part of the trouble-hunting problem.

Case No. 8—Motor Will Not Operate

If the compression is normal.
If the carbureter is working properly.
If the timer on the battery side is working satisfactorily.
If the battery ignition system is in good order.
If the battery is up to voltage and in good condition.
If the spark coil is in good order.
If the magneto ignition will not work.
If there is no spark at the spark plugs on the magneto side.

It Stands to Reason

That the secondary wiring has an open circuit.
That the secondary wiring has a short circuit.
That the distributor contacts are not bearing.
That the distributor is short-circuited.
That the primary contacts in the distributor are worn out.
That the wiring is not connected up properly.
That the inductors on the armatures are short-circuited.
That the permanent magnets have lost their magnetism.
That the driving mechanism is not working.
That the condenser is defective.
That the ground connection has an open circuit.
That oil and dirt have affected the insulation, causing a general leak.

Case No. 9—Motor Will Not Operate

If the compression is normal.
If the carbureter is working properly.
If the ignition system is in good order.
If the gasoline supply is adequate.
If the motor back kicks.

It Stands to Reason

That the motor is overheated.
That the spark is advanced too much.
That the spark is retarded too much.
That there is lost motion in the spark control system.
That there is a carbon accumulation in the combustion chamber.
That the gasoline has detonating properties.
That the compression is too high.
That the timer is adrift.
That there is a broken tooth in the half-time gear.
That the camshaft is not properly set.

Case No. 10—Motor Runs Normally

If the clutch holds.
If the speed-changing mechanism sticks.

It Stands to Reason

That the sliding gear shaft is bent.
That the clashing edges of the gear teeth are battered up.
That the sliding mechanism is awry.
That there is a sticky bearing.
That there is a broken link or lever.
That there is a broken or sprung gear case.
That there is an accumulation of gummy or cold lubricating oil.
That there is a key lost out of a keyway.
That there is an entire lack of proper lubrication.

Case No. 11—Motor Runs Normally

If there is trouble in the gear case.
If the change gear lever is free.
If the clutch movement is free.
If the clutch holds.

It Stands to Reason

That there is a key out of a gear.
That there is a stiff gear.
That there is a bent shaft.
That the shaft is twisted off (planetary type).
That the gears do not engage when they are shifted.
That there is a broken member in the control system.
That there is an excess of lost motion.

Case No. 12—Motor Runs Normally

If there is trouble in the clutch.
If the change speed lever works freely.
If the clutch movement is free.
If the clutch slips.

It Stands to Reason

That the leather facing is oily.
That the leather facing is charred.
That the leather is hard and does not press uniformly.
That the clutch spring is weak.
That the clutch is out of alignment.
That the sliding bearings are dry.
That the clutch faces are worn and the limit of travel has been reached.
That the clutch band is broken.
That the clutch lever is bent.
That the clutch dogs are worn out.
That there is excess lost motion in the toggle.
That the foot lever strikes the deck.
That the take-up is all in.
That the disc facings are worn.
That the discs are adrift on the shaft, due to defective keys.
That the clutch is prevented from engaging by dirt or other impediments.

Digest of Foreign Papers

Matter that is taken from foreign publications, selected for its value to the engineer, allowing that ideas that are well known in American practice will scarcely be worth recording in view of the value of space.

THE accompanying diagram, from *The Autocar* of March 11, has been designed by Mr. J. Dalrymple Bell, with the object of facilitating, to the last degree of simplicity, the work of ascertaining the number of engine revolutions per minute at various road speeds. It is only necessary to know the road speed, wheel diameter and gear ratio, and then the engine speed can be ascertained. For instance, a motorist may desire to know the speed of his engine in revolutions per minute when his car is traveling at a certain speed in miles per hour. By the usual method of obtaining this information a considerable amount of calculation would be required, but with the diagram herewith the most unskilled in mathematics can surpass in point of time the most facile slide rule operator in obtaining the desired result. To find on the accompanying curve the number of revolutions per minute that the engine is making at any speed find the miles per hour on the top line and follow the vertical line down until it cuts the wheel diameter line. Then move along a horizontal line until a point vertically above the gear ratio on the bottom line is arrived at. The engine revolution curve which passes through this point, or would pass through it if drawn up, gives the required engine speed.

For instance, a car is proceeding at 30 miles per hour; it has 32-in. wheels and a 3 to 1 gear ratio. What is the engine speed?

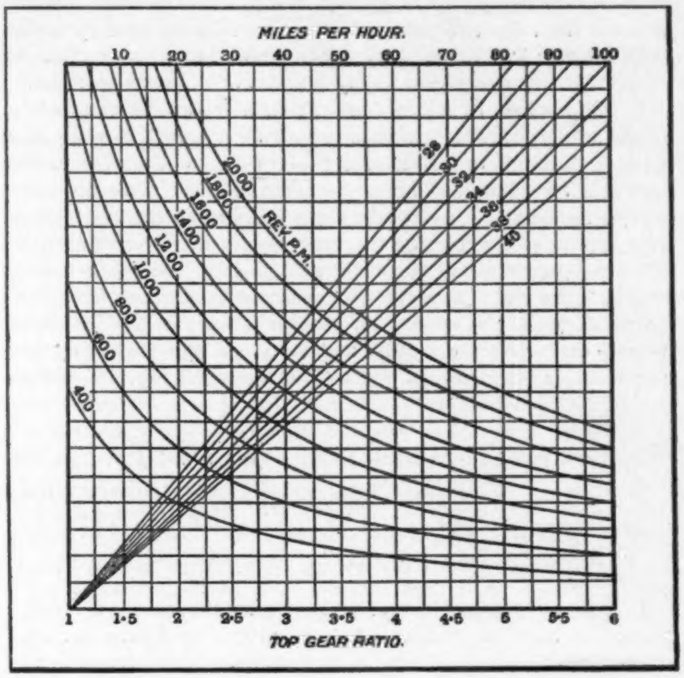
Proceed along the top line till we strike figure 30; drop vertically till the 32-in. wheel line is reached. Then work horizontally till the vertical line is met from the gear ratio number 3 on the baseline. The nearest engine revolution curve will show that the engine speed is nearly 1,000 revolutions per minute.

If any three of the four quantities—gear ratio, speed of car, wheel diameter and engine speed—are known, the fourth one can be found by inspection. Engine speed in revolutions per minute is, however, the factor usually required; we have therefore taken that for our example. The following is a conversion table for wheel diameters:

Mm. In.	Mm. In.	Mm. In.	Mm. In.	Mm. In.
650=25.6	760=30	820=32.3	880=34.6	965=38
700=27.5	800=31.5	863=34	895=35.25	1018=40
710=28	810=32	870=34.25	920=36.2	
750=29.5	815=32.2	875=34.5	935=36.8	

* * *

An instructive demonstration of the properties and scope of application of solid petrol was given recently at the offices of The Solidified Petroleum Company, Amberley House, Norfolk Street, Strand, London, W. C. Solid petrol is a stiff jelly-like transparent substance having the characteristic odor of liquid petrol. It is easily cut up into blocks for packing and is perfectly safe as regards risks of possible leakage and evaporation. As a fuel for motor car engines entensive trials have proved that it compares very favorably with liquid petrol. It is claimed that the actual consumption of solid petrol under similar conditions is much lower than that of liquid petrol. Moreover, it has the notable advantage that no special carbureter is required. The solid petrol generates gas automatically under ordinary atmospheric conditions; therefore by simply passing air over pieces of solid petrol contained in a box an efficient explosive mixture is obtained. A considerable simplification of the car would result, there would be no leakage, flooding or needle valve grinding or any of the usual carbureter defects to contend with. It is claimed that the mixture obtained by simply passing or inducing air over the solid petrol is a very homogeneous one, and this ensures perfect combustion. With liquid petrol the formation of a homogeneous mixture is, as is well known, rather difficult to obtain, special means having to be employed to ensure a sufficiently fine breaking up of the liquid into particles to obtain perfect combustion. The solid petrol



A new curve, from which, when the details of any three are known, either the engine speed, speed of the car in m.p.h., wheel diameter, or gear ratio may be obtained.

gives off a "dry" gas, which means that it is in the finest possible state of division or perfectly atomized, in which condition it can be used for car lighting. The method of obtaining a very powerful light is extremely simple. From an ordinary steel cylinder containing compressed oxygen a small bore pipe connects up to a small metal case—actually a tin cylinder—containing pieces of the solid petrol. The stream of oxygen passing over the petrol carries along with it petrol vapor which is conveyed to an ordinary head lamp, the acetylene burner of which is replaced by a simple jet which plays on two very small pieces or rods of incandescing material made of the rare earths.—*The Motor.*

Extending the Life of the Tires

For the Benefit of the Automobilist

This article shows, by illustrations and otherwise, how the automobilist can make his tire-bill less than half of that which the average automobilist pays, at no greater cost than a little time and by doing the things that will accord with the characteristics of rubber and fabric. It is also related how the automobilist may know what to do when the tires are examined for the purpose of determining whether or not they may be profitably repaired and how they may be employed on a supernumerary basis for the good of the service.

APPROACHING seasonable weather the automobilist who has had his car out of commission for the Winter will be more or less alive to its needs, and overhauling the mechanisms will be one of the fitting undertakings, but having gone into this matter at some length in THE AUTOMOBILE within the last two or three issues it remains to pay attention to the tire situation for the purpose of lending assistance to the furtherance of this important matter. Experience of at least one season under running conditions with a car affords to the owner thereof a keen insight into some of the shortcomings, and it is reasonable to suppose that he will have a good idea of whether or not the tires used are too expensive to maintain, comparing with an average situation, and if the previous experience is such as to warrant the owner in reaching the conclusion that the tires are not large enough for the work they have to do, he may be confronted by the necessity of investing in a new set of tires of a somewhat larger section, since the diameter cannot be changed, but it would be an economical procedure to fix up the old tires with a view to using them on the front wheels, thus limiting the purchase of new tires to those which may be employed on the rear (driving) wheels of the car.

In one case in connection with taxicab work, in which the Editor of THE AUTOMOBILE had an opportunity to note the performance of tires and the cost of maintenance, it was found that 34 x 4-inch tires were giving intolerably poor results, but by

changing the equipment to 34 x 4 1-2 inch tires the cost of maintenance from the tire point of view was reduced to a moderate level, and it was believed by those who were in a position to judge that this was a very happy solution of a serious problem.

In the purchase of a new tire equipment for an old automobile, if the old tires are worth repairing at all, it would seem to be a wise proposition to overhaul the old tires to whatever extent the existing condition might indicate, and use them on front wheels exclusively. By purchasing new tires of the same diameter and large section for the rear wheels the overworking of the tire equipment will be ameliorated, and the old repaired tires will be more likely to serve with reasonable satisfaction by confining them to the work that they will have to do on front wheels only. As the strains and stress on the front tires are considerably less than on the rear a retreaded tire will not be put to such hard usage.

The Best for the Money Is Not the Wise Plan in the Purchase of Tires—Unexcelled Superiority from the Quality Point of View, and Tires That Are Large Enough for the Work, Are More to the Point.

If it may be assumed that each tire maker knows the capabilities of his own wares, it will be proper to follow the recommendations of the respective tire makers in reference to the sizes of tires that should be employed on cars of a given weight. When an automobilist purchases tires of a given make he should also obtain the literature on the subject as put out by that maker, and by studying this literature learn of the conditions which the maker agrees to as being suited to the tires. It is a great mistake to reach the conclusion that the tire-maker's literature is on a par with the average catalogue. A distinction should be made between catalogue talk of the ordinary sort and the instructions that tire makers give to their clientèle through the medium of a booklet they put out for the purpose.

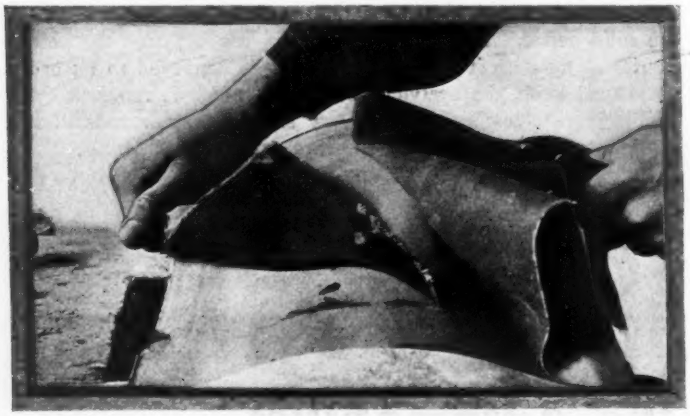


Fig. 1—Depicting a damaged middle layer of frictioned fabric which was brought into view by cutting away the exterior layers in a bold manner

Fig. 2—Removing the outer layer of the frictioned fabric, the latter being so rotted as to be of no further value in future tire service

The general recommendations that would seem to be of value in relation to tires should not be construed as annulling the specific instructions that tire makers issue in relation to their wares. On the other hand, it is not in keeping with the actual facts to subject tires to all sorts of abuses just because the maker thereof states that they are as good as can be, thus assuming that only inferior tires are to be handled with care, and that the abuse to which good tires may be subjected is to be looked upon with equanimity.

Fig. 3—Removing the tread in order to be able to get at the carcass for the purpose of ascertaining the condition of same

Judgment Should Be Brought to Bear Before Old and Worn-out Tires Are Subjected to the Repairing Process

Possibly it will be of advantage to restate some of the principles that underlie the building of tires in view of the service they are expected to render. There seems to be a strong impression among those who use tires to the effect that they are made of rubber and that it is this strange material to which credit must be given for the good work that pneumatics are noted for. Plebeian cotton, which composes upward of 70 per cent. by volume of an outer case, is overlooked. For the purpose of showing that this view of tire making is not founded on fact, fire hose will be taken as the illustration, when it will be plain to anyone that the cotton fabric of which the hose is made is the essential part, as far as strength is concerned, and that the rubber coating on the inside and outside of the hose is only put there to prevent the water from contacting with the cotton. The makers of hose fully understand that the cotton fabric must be of the best weave, and that water must be kept from contact with the cotton to prevent it from deteriorating.

There is only one reason why the tire problem differs from that of the fire hose. It will be remembered that the hose is not rolled along the ground, which would induce relative motion in the section of the fabric, but in tires as they are used on wheels of automobiles this rolling process does take place and the layers of the fabric tend to slide upon each other. In the making of tires in view of the changing conditions the fabric instead of being coated on the inside and the outside is "frictioned," and when the layers are brought into contact with each other in the building of the carcass of the tire the frictioned fabric, due to pressure and vulcanization, is brought into a homogeneous relation by the welding of the rubber on the respective surfaces of the fabric, joining layer to layer from the inside to the outside.

The designation "frictioned fabric" is confined to the qualities of cotton fabric that are first put through a process by means of which raw gum rubber is pressed into the interstices of the

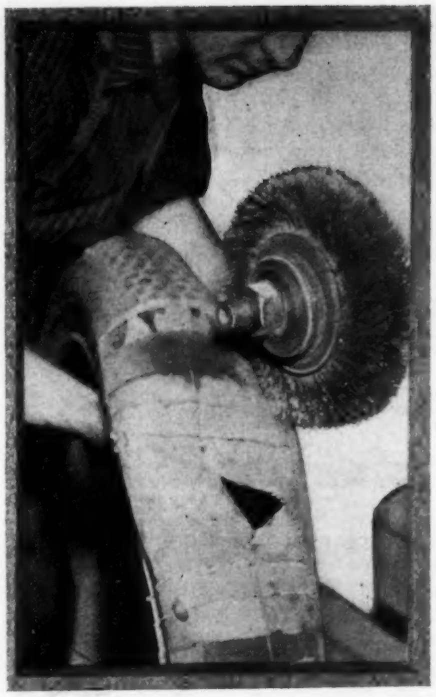


Fig. 4—Using a buffing wheel against which the tire is held for the purpose of cleaning the exposed layers of the fabric and buffing away frayed edges.

fabric, forming a smooth rubber exterior, thus preparing the fabric for use in the building up of the carcass of the tire. Tires are built up using an inner layer which is frictioned on one side only, it being the case to avoid the presence of rubber on the inside so that the inner tubing will not stick to the outer case. Between each successive layer of frictioned fabric a layer of raw gum rubber is placed, the latter being in sheet form, and in the building up of the tire, utilizing frictioned fabric and layers of raw rubber, from five to eight layers of the fabric are employed, the latter being of from eight to twelve-ounce cotton of a special weave, and Sea Island cotton is looked upon as the most efficacious in this rigorous service.

The raw rubber is made up of superior grades, presumably of the "Para" variety, and it is composed of a predominating percentage of the latex intermingled with a suitable proportion of the vulcanizing ingredients and, as experience would seem to indicate, such other elements as are likely to impart strength without reducing elasticity and life under conditions that tires are required to serve.

The outer layer or tread is made of a "toughened" rubber compound, and since the function of this layer is to shield the carcass from the harm that threatens, due to varying road conditions, speed and work, the compound is designed to accomplish this end, but it has few of the properties that should reside in the layers of rubber gum intervened between the courses of the frictioned fabric. The bead also is of a toughened compound, in which it is fair to say the percentage of Para latex is reduced to a minimum.

In the Light of Tire Construction Practice the Service Expectation May Be Discussed Intelligently

From the methods employed in the construction of the tires, considering that cotton fabric is a strong material, it remains to be said that the rubber is used first because it shields the cotton fabric from water, and the mildew that resides within the water, and the rubber also serves as the binder between the layers of the cotton fabric, so that as the tire is rolled along the ground the working of the layers of the fabric, one upon the other, does not include the cutting and abrasive conditions that would surely obtain in the absence of a buffer medium between the respective layers.

The rubber, then, serves two functions; it is a buffer between the layers of the fabric, preventing destruction due to relative work, and it is the armor that guards the cotton fiber from the attack of mildew and other fungus growths of which water holds myriads. The first property of the rubber has to do with the every-day service of the tire, but the armor idea comes into play as the feature which prevents decay. In guaranteeing tires the makers thereof take into account the effect of service under a given set of conditions, and the effect of time, due to the rotting, so called, that the fabric undergoes, especially when the rubber is damaged and the cotton duck is exposed to "infection."

It is a great mistake for an automobilist to assume that the rubber is there for the purpose of giving strength and resiliency, for in all truth the property designated as resiliency is present in the air that is used when the tire is inflated, and the object of the tire when the whole truth is told is to serve as an envelope, by means of which the resilient air may be confined to the enclosure thus provided, so that advantage may be taken of the excellent properties of the air for the intended purpose. If the rubber is merely viewed as a strength-giving medium, when the automobilist observes a little wound on the surface thereof, he will say to himself "it is a small affair." But if the same automobilist goes into the woodshed with his slippers on and a rusty nail goes through the sole of one of them into his foot, he will ring for the doctor, and he will undergo the excruciating pain of having the wound thus made cauterized and dressed, the fear being that infection will set in and it may cost the poor automobilist the major portion of a leg. When a nail is driven through the carcass of a tire case, and a wound is thereby made, infection creeps in through the port holes so designed and lodges in the fabric with the result that strength too soon departs and a blow-out announces the result.

The Inspection of an Old Tire with a View to a Possible Repair Must Include an Estimate of the Strength of the Fabric

If the tire has been neglected, and infection entered through many little wounds, it will be found no doubt that the fabric is

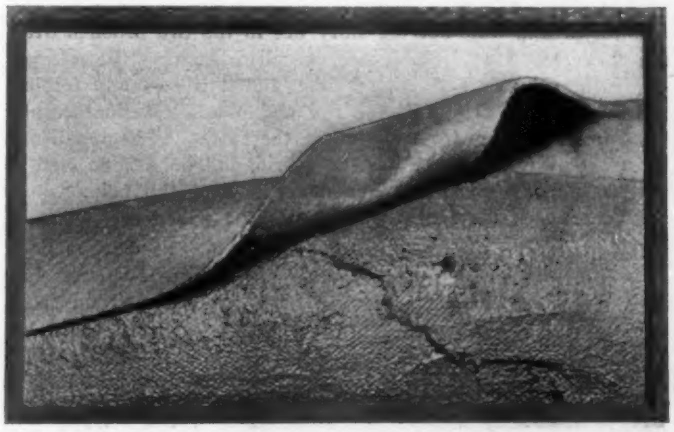


Fig. 5—After cleaning the exposed serviceable fabric it is solutionized and uncured gum rubber in sheet form is put on as the foundation for a succeeding layer of the fabric

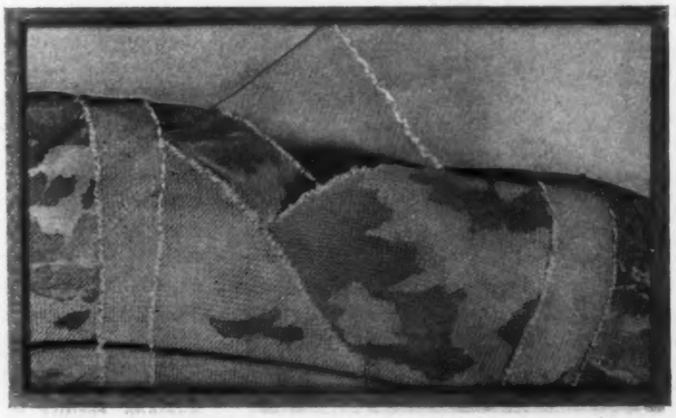


Fig. 6—Showing the building up of a tire when the fabric was damaged through all of its layers as in a blowout

rotted, and that there will not be enough of it in a state of unimpaired strength to support a rebuilding process. Good sense would suggest that if the fabric throughout the tire is decayed there will be nothing left upon which to replace the rebuilding material that will be strong enough to serve for the intended purpose. A new tire will be the best investment under such conditions. But if the deteriorating process is confined to one or more isolated spots on the tire, the good fabric will be in sufficient presence to support a rebuilding process, and the undertaking will be worth while.

In the repairing of the outer casing under proper conditions, the repairman must be sure that he removes all of the infected and rotted fabric, and that the building-up process will be upon a firm foundation. This is not true even when professional repairmen do the work, in a good many instances, and it is a great misfortune perhaps that the automobilist when he pays the bill has no way of telling whether or not the old and decayed fabric has been removed and that the new portion has been built up from a firm foundation. The illustrations as here afforded from Figs. 1 to 12 inclusive should suffice to indicate the needs of the occasion, and they should also tell the relatively inexperienced automobilist how far it pays to go in the repair of a tire under proper conditions.

Fig. 7—Showing how unvulcanized gum in layer form is put on over a layer of fabric in the repairing process

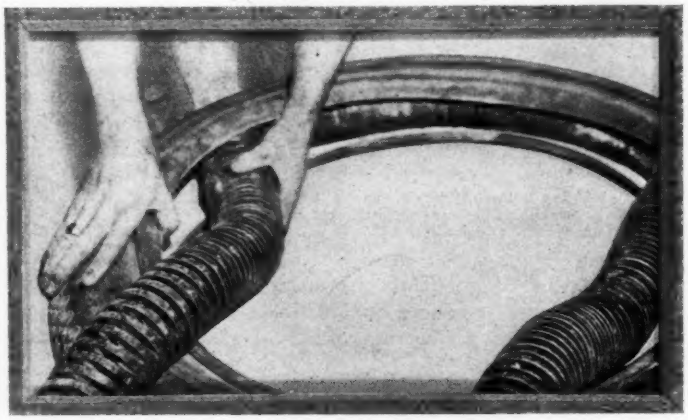


Fig. 8—Showing how a coil is used, placing the same inside of the case so that when it is wrapped it will adhere to its shape during the vulcanizing process

Judgment Should Be Used at the Time of Deciding to Have Tires Repaired. It Is Not Enough to Shoulder the Responsibility Upon the Repairman; He Has His Own Troubles to Contend With

The fact that a tire has a big blow-out in it is no indication of the impossibility of a good repair. The blow-out might be caused by a bruise, as when the car is rolled along the road at a high speed, and one of the tires is brought into violent contact with a "nigger head." There is no economy in driving automobiles in this way, but the story lies in the tire problem after the damage is done. The bruise, so called, destroys the strength of the fabric over a restricted zone, and it is perfectly feasible to rebuild this portion of the tire and obtain excellent results by way of service from the same thereafter. The repairman must cut away all of the bruised fabric, and he will do well to cut back for a considerable distance beyond the point where the bruising of the fabric is visible to the naked eye.

Fig. 9—Showing the solutioning process by means of which rubber gum is smeared over fabric surfaces prior to laying on the succeeding unit.

In like manner if a wound has been left unhealed and the fabric in the region around the wound deteriorates as a result, it is possible to cut away all of that portion of the fabric, and to rebuild the tire so that it will serve a long time thereafter and amply reward the not too prudent automobilist. Real unadorned prudence would come in the process of healing up the wound the same day that it occurs. But even if this operation is delayed until some damage results it is still an advantage to undertake the repair and to do the work so thoroughly that the rebuilt tire will be of uniform strength throughout, remembering that all of the new fabric that is attached to infected old fabric will be no better than the older material.

Some Tires Are Not Worth Repairing Although They Look Better Than Those Which Are Rent by a Blowout

The difference between a tire that has been bruised or otherwise damaged locally and one that has been ruined due to excess flexure in the absence of proper inflation is a matter that should not be overlooked, in view of the fact that the bruised tire is susceptible of good repair, whereas the tire that has been excessively flexed will scarcely be worth working upon. Under average conditions, the cost of repairing an outer casing, if it is a general overhauling, is about 50 per cent. of the cost of a new outer casing. It will not be worth while to pay so much for a repair unless it can be shown that the repaired tire will last for a sufficiently long time to bring to the owner thereof a return upon his investment. If the fabric is damaged uniformly, as it will be under conditions of excess flexure, there will be no foundation upon which to build the repair, and service that may be expected under such conditions will be far below the level of advantage.

To the man who will take a piece of wire, hold it in his two hands and bend it back and forth until it breaks, there will be no difficulty in getting him to understand that when a tire is flexed in exactly the same way it too will break. The cotton fabric of which the tire is made will not break as quickly as the wire. The time that the fabric will last, however, under such conditions is not sufficiently long to serve the intended purpose in view of the cost. The way to prevent this excess flexure is to so inflate

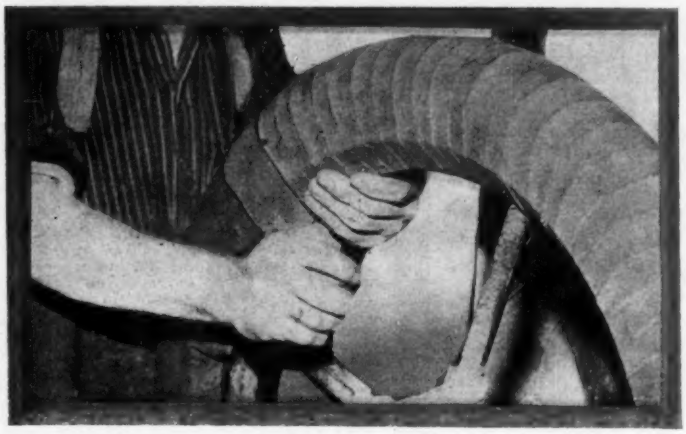


Fig. 11—Depicting the method of wrapping the casing after it is built up prior to the vulcanizing process. It is wrapped with tape to hold the layers in contact until they are rendered homogeneous by vulcanization

Fig. 12—Presenting a form of sectional steam vulcanizer used by professionals. The automobilist may employ special forms of vulcanizers that are handier for him of which the market affords excellent examples

the tires that they will sustain under the load they have to bear without flexing.

The man who does not understand that the wire will break in the manner as here described is the type of man who argues that a tire should not be stoutly inflated for fear the fabric will be unduly stressed. He is incapable of understanding that flexure is the great enemy of the tire and that the fabric is perfectly capable of sustaining under all the pressure that a pump can induce therein. A bicycle tube will run for a long time under a pressure of 500 pounds per square inch and experiments of this character have been conducted for the purpose of ascertaining the fact, but the same bicycle tube will give out in a half day if it is run nearly flat.

When a tire is being pumped up if a gauge is not used for the purpose of determining the amount of pressure, the automobilist will have to rely upon his own intuition rather than upon a definite way of noting the extent of the pressure. Intuition under these conditions will be the product of weary muscles. The automobilist pumps until he gets tired; intuition says the tire is fully inflated. The fact that intuition is a poor prognosticator is proven by the short distance the automobilist goes before he invests in a new tire.

When a tire gauge is employed in the process of inflating tires there is still opportunity for making a grave mistake, due to the fact that when air is squeezed through a small and obstructed orifice the pressure increases locally due to molecular work, and when the tire is finally inflated, the gauge registering perhaps 80 pounds per square inch, the real pressure residing within the tire may be as low as 60 pounds per square inch, due to the difference between the actual air that passes through the restricted small orifice, and the amount that the automobilist thinks has made its way into the tire.

Temporary contentment of the mind will be the lot of the unfortunate automobilist, but the degrees of inflation under such conditions will be insufficient to protect him from an undue tire bill, and unfortunately instead of finding the real trouble and remedying it the automobilist will say that the tires are not good. Even when a pressure tank is used in a garage, and the pressure thereof is maintained at, say, 90 pounds per square inch, it rarely happens that the tires inflated therefrom reach a pressure of 70 pounds per square inch.

The Metric System

Some reasons why it has not become popular in American automobile factories are: That the workmen are trained to think in English; that a change would delay production; that mistakes would be more numerous for a long time, and that there would be no appreciable lessening of cost.

THERE are many reasons why the metric system is so little used by American builders of automobiles. To begin with, the metric system is not an American idea. If a workman is trained into thinking in English, so to speak, it is highly improbable that he can drop that habit and take up with a new one without making quite a number of mistakes.

That the English method of measuring is thoroughly good in every practical way is shown by the excellence of the work that is done under its sway. The real English unit of measurement in shops devoted to the building of automobiles is the thousandth of an inch, and fractions of this unit are taken on a decimal basis. The authorized standards of the two foundations of linear measurement are as follows:

The International standard meter is derived from the Mètre des Archives and its length is defined as the distance between two lines at 0 degree Centigrade.

In the English system (which is the same as the United States standard) the Troughton scale is the standard.

From the cost point of view, there are many other reasons why makers should go slow about adopting new standards of measurement. Take the centering of gears in a transmission system; if noise is to be aborted the centers between the prime and lay shafts must be true within 0.0005 inch. This accuracy is assured, not by depending upon artisans to scale closely, but by the use of gigs; is it the use of any system of measurement that governs this? No. The distance is fixed by the pair of gears used.

The inter-relation of the members of an automobile are fixed independently of the system of measurement for the most part, and it is highly improbable that such matters can be readily shifted. Men must speak the language that they understand or they will fail to grasp the situations that confront them.

Fig. 10—In the repair of an inner tube unvulcanized gum must be worked into opening as well as on surface, and the patch vulcanized

What Some Subscribers Desire to Know

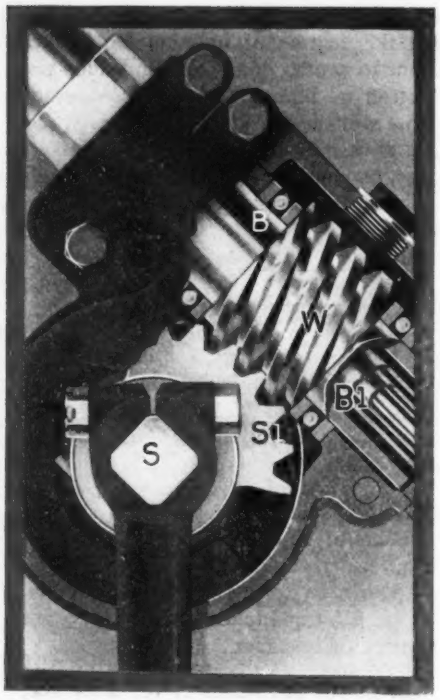


Fig. 1—Interior of a steering box with worm and sector and drop arm attached to a square on the shaft

Steering Gears Cause Back Lash

Editor THE AUTOMOBILE:

[2,602]—The steering gear of my car has given me recently considerable trouble, and, owing to the back lash, the steering is very erratic. I have tightened the adjustments several times, but there is still a lot of lost motion. Could you tell me what the cause of the trouble is likely to be?

SAFETY.

Norwalk, Conn.

The steering gear is composed of several working parts, and a small amount of play in each one will aggregate quite a lot between the steering wheel and the road wheels. If you try a process of elimination, starting at the road wheels and going over the ball sockets and pins, you will be able to see where there is play. Having assured yourself that everything is as it should be up to the steering box, your first inspection of this part should lead to the assembly nut A in Fig. 3 and then the attachment of the pinion or sector to the shaft S. These are fitted in different manners, such as are illustrated in Figs. 1 and 3. If the shaft S is fitted with a key make sure that this is a good fit in the slots in the shaft and drop rod. If, however, a square is used in the manner shown in Fig. 1 the holding bolt may have sprung and allowed the drop bar to have worked loose on the square. You can see if this is the case by turning the steering wheel and noticing if the shaft responds immediately and operates the bar at the same time. Any play will be noticed by the shaft turning without operating the bar at once. If the shaft does not respond to the turn of the wheel, the play exists in the worm and sector relation to one another. The worm W is usually made of steel and is hardened, so that it is improbable that any wear has taken place at this point. The sector or pinion, however, is usually soft, made either of phosphor bronze or steel. In the case of Fig. 3 it is not a difficult matter to remove the pinion P and by turning it a matter of 90 degrees a new spot on it will be found to mesh with the worm. It is different, however, with the type illustrated in Fig. 1. Here it is necessary to blue the worm and find the binding spots on it and the pinion, and file or grind them off so that the lateral eccentric adjustment will bring the centers into even mesh and prevent binding at the extremities. If the worm is case-hardened and a grinding machine is not available, it will be necessary to anneal it, fill it to the required amount and reharden it. This requires considerable care and some skill to prevent warping.

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their automobile troubles, stating them briefly, on one side of the paper only, giving as clear a diagnosis as possible in each case, and a sketch, even though it may be rough, for the purpose of aiding the Editor to understand the nature of the difficulty. Each letter will be answered in these columns in the order of its receipt. The name and address of the subscriber must be given, as evidence of good faith.

Learn How to Put Tires on Clincher Rims

Editor THE AUTOMOBILE:

[2,603]—Kindly tell me through the columns of THE AUTOMOBILE how to avoid pinching the tubes on my car when I insert same. They are clincher tires.

A SUBSCRIBER.

Port Richmond, S. I., N. Y.

A step-by-step process would be as follows:

(a) Put in all of the lugs and screw caps, taking care to just catch the threads on the lugs.

(b) Put the inner tube in the casing and inflate the same to roundness.

(c) Remove all wrinkles, overlaps, or other imperfections.

(d) Turn the wheel around so that the valve hole will be at the top.

(e) Dust soapstone over the tube, as it rests inside of the casing, rolling the casing along the floor or bumping it up and down upon the floor, to produce an even distribution of the soapstone over the surfaces of the casing and the inner tube.

(f) Take the partially inflated tube and casing combined as dusted with soapstone and free from foreign matter and approaching the wheel with the valve hole at the top, insert the valve in the hole and thereafter adjust the side bead of the case in place on the rim.

(g) Loosen the brakes so that the wheels will be free to rotate, and considering a right rear tire, take up a stooping position at the rear of the wheel, placing one hand on each side thereof and by exerting some pressure manipulate the bead so that it will rest on the center of the lugs all around, they serving as saddles, as it were. Use the tire iron in the left hand during this

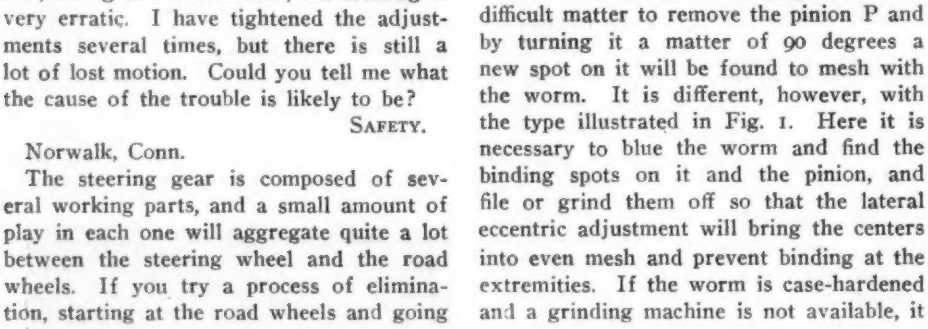


Fig. 2—An easy brake adjustment that can be fitted to any car, very little alteration being necessary

What Other Subscribers Have to Say

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their personal experiences for publication in these columns for the worthy purpose of aiding brother automobilists who may be in need of just the information that this process will afford. Communications should be brief, on one side of the paper only, and clearly put, including a rough sketch when it is possible to do so, and the name and address of the writer should be given as evidence of good faith.

operation, simultaneously holding the lugs down with the right hand, and in this way proceed with each of the lugs until the bead on the tire rests on the center of all of them.

In the next step lift the bead upwards with the iron and push it over the lug as far as it will go and then let go of the bead, when it will fall into its proper place. Repeat this operation with each of the lugs.

With the tire on the wheel and the inside bead resting in its proper place it remains to pry the outside bead over the outside clincher, using some care in the process in order not to pinch the inner tube.

It will be understood that the left front tire should be approached in the same way as above outlined for the right rear tire, and the left rear tire should be approached in the same way as for the right front tire. It will also be understood that it is desirable to stand in front of the car when putting on front tires and to stand at the back of the car when putting on rear tires. It will be found in practice that this method of procedure will save labor and avoid disagreeable tugging, nor will the tubes be pinched by the tire irons in the process.

Quick Adjustments of Brakes Induce the Autoist to Attend to Them

Editor THE AUTOMOBILE:

[2,604]—I was much interested in your recent reply to a letter with reference to the quick adjustment of brakes. The drop arm of the side brake of my car is very short and the slightest wear necessitates tightening it up; otherwise the travel of the lever is too short to effectively operate the brake. Could you give me a sketch of some adjustment that would facilitate matters? I cannot lengthen the drop arm, as the rod would foul the gear case.

T. D. W.

Allentown, Pa.

Fig. 2 shows what you want. The rod R is threaded for about six to eight inches from the end and has a nut on the opposite side to the wing nut N. By slackening the lock nut it is an easy matter to give the wing nut a turn from time to time. The slot S in the frame should be slightly wider than the rod and the U section fitted with a wooden block also slotted. When the rod vibrates it will touch the wooden block and thus prevent it rattling.

Leather Shoes Protect the Steering Joints from Wear

Editor THE AUTOMOBILE:

[2,605]—What is the best method of preventing the ball sockets of the steering gear from wearing? I live in a very sandy district in the summer and the sand gets in these parts and eats them away.

Tonawanda, N. Y. X. Y. Z.

Leather boots similar to those shown in Fig. 4 are what you require, and if they are packed with grease there is no reason why the sand should cause the wear you complain about. There is another remedy that can be used in combination with the boots, and that consists in removing the boots every fortnight and washing the ball sockets out with kerosene, using an oil gun for the purpose, the force of the stream of oil will remove all impurities. It is the old tale of an ounce of prevention.

Adjust the Carbureter for High-Speed Work

Editor THE AUTOMOBILE:

[2,606]—Kindly answer the following questions:

Assume that the compression is fine on

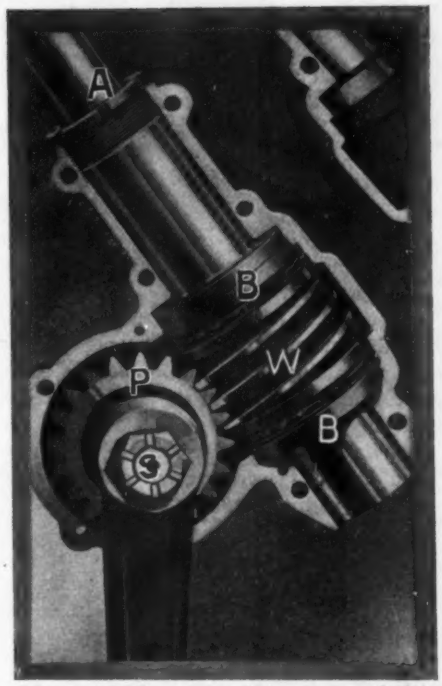


Fig. 3—Working parts of the worm and pinion type of steering showing end ball thrusts and drop arm attached to the shaft by keys

all four cylinders; that the spark is good at all speeds; that the carbureter has been adjusted; the motor runs good, going slow, but spits when speed up, and also misses and has no power. Kindly state the trouble and how to remedy it.

Brooklyn, N. Y. J. D. C.

Our belief is that the carbureter is not delivering enough gasoline at low speed. The first thing to do is to readjust the carbureter with the motor running free, making it go as slow as possible. Then speed the motor up and make it go as fast as possible by adjusting the auxiliary air valve. If your statement is true in relation to all the other functioning elements the motor will perform satisfactorily after you adjust the carbureter in the manner as here stated.

Fig. 4—Method of shielding the steering connections from wear by fitting them with leather boots

As to the American Invasion

Relating some of the German peculiarities, and affording information on some points of importance concerning social conditions in the Kaiser's dominions as they affect the production and sale of automobiles there. The German greatly resembles the Missourian in that he wants to be shown.

JUST as taxation in some form or other and in proportion to the magnitude of property is imposed upon the same, so every degree of wealth entitles its owner to a corrsponding amount of pleasure and enjoyment, a privilege as just as the law of taxation. Average men of equal means will, in all probability, have similar desires and pleasures, among which —considering those of the well-to-do class of the day—the motor car occupies a prominent place. A certain percentage of the men capable to purchase and maintain an automobile will do so, and in this respect the automobile market bears a well-defined relation to the pecuniary situation of the better middle class of a modern nation.

The amount of automobile business done in Germany at the present is not by far as large as could be expected, judging from the wealth of the class holding in its ranks the possible buyers of the goods. As has been shown on a former occasion, the German automobile trade amounts to hardly 25 per cent. of what it should be, considering only the wealth of the average individual. The reason therefor lies, to a large extent, in the trade conditions of the country, which are not up to date. Still, these conditions cannot solely be made responsible for such a low "trade efficiency," but there is quite a number of additional reasons, some of which may be modified by human efforts, thereby forming a new field for industrial and commercial endeavor.

The social strata in Germany are more numerous than those existing in this country, and other distinctions are being aimed at by the little-above-average citizen than the one of belonging to a mediocre sort of "smart set." Many a family boasts of a library worth one or two automobiles, which, together with club life in one form or other, offers to the educated German business man just the kind of relaxation he desires, by virtue of his education and his national traditions. The necessity of going beyond the city limits in order to get fresh air is not as pressing in German cities as in America, since on the other side there are no tall buildings to obstruct the way of the wind bringing fresh air from the country into the cities. Hence, the latter are well ventilated in general, and besides there are beautiful and well-kept parks in almost every city of the Empire.

Life is rather quiet over there, and hurry, in the American sense of the word, is unknown to Germans. The busiest banker finds or takes three hours' time for his luncheon, and therefore the automobile as a swift means of transportation does not appeal to him on the ground of mere speed. Nor does it offer extraordinary attractions to the suburbanite working in a city, as railroad connections are very satisfactory, and the first-class railway coaches are more luxuriously furnished than a motor car can possibly be. It is rather the exclusiveness of the automobile and the air of noblesse the auto at this time lends to its owner which lead the wealthy German to purchase a car. The buyers are always possessed of a certain sense of sport and, excepting those of the very rich class, generally have some understanding of the inner workings of the automobile; they are able to control, at least to some extent, the chauffeur in his work of keeping the car in shape, and most of them lose no opportunity to do so.

In most cases the buyer is gifted with some discrimination, and sufficient forethought is given to the act of purchasing an automobile to make the prospective buy a car with a fair chance of living at least seven or eight years provided the proper care be extended to the machine. In order to reduce the cost of the automobile during this period to the lowest possible level, the car bought must not bear the earmarks of a momentary fashion not destined to last for at least some years; nor will the average buyer select a loud or especially sensitive color which cannot be used for more than one or two years. For this reason, it was not till the second half of last spring that the fore-door type found more general introduction in Germany; and an inspection of the principal German cities and towns will show that the percentage of red, white, cream-colored and yellow automobiles is much smaller there than it is in America. The same applies to what are generally called extravagant creations of body builders.

The German buyer is not very apt to experiment and for this reason a very few makes of tires are in use throughout their country, such names of Continental, Michelin, Goodrich and Peters' Union designating the standard. New makes are making little progress, although some American firms have opened quite extensive advertising campaigns of late. The German buyer, like the man from Missouri, wants to be shown, and the German salesmen are very capable of doing this work, however technical; and they do it perhaps at the expense of their more commercial abilities. Not only does the salesman have a clear idea as to what materials are used in his car and what processes they have gone through; but his mind also holds a number of technicalities the average buyer is not able to grasp, which, of course, does not help to create an agreeable sensation on the part of the customer. In fact, German salesmanship is not quite up to date, in that the importance of the personal equation in the transaction is not recognized or rather not fully appreciated by the salesmen. While the standard methods of production practiced in the United States have been copied to advantage by the Germans, the American lesson in selling methods has not been learned throughly by very many people; and many Germans who had learned this lesson in America, upon their return to their home establishments had not the power or energy to introduce the modern commercial ideas, owing to the opposing inertia of the other men in their businesses. Thus it seems that American methods will best work in the hands of Americans—another argument for the good chances American automobile traders have in the European field.

In Finishing the Car

In painting and finishing the automobile there are three indispensable factors to be considered: First, durability; second, choice and distribution of color upon the surface; third, quality of finish.

IT is important, admittedly, that the structure of paint and varnish, built up with such an infinite capacity for taking pains, should prove durable. Even the man with wealth to "tear down his barns and build greater" is looking for the paint and varnish for his automobile that will stand out with tenacity in the face of the most rigorous service.

In the matter of appearance, color brilliancy and disposition of color upon the surface with reference to developing all its possible charms, are advantages which even the most calloused user of the automobile will be quick to admit. An individual pride has developed along the line of creature comforts and satisfaction as a part of automobile experience, that is creating an increased demand for all that is finest and best in color, harmony and contrast.

Apparently, it is a case, in the most part, of the owner trying to outdo his neighbor in getting all the color possibilities which the painter is capable of showing.

Without the right quality of finish, however, all these things —quality, color magnificence and striping combinations—must prove only transitory and of small moment. With this clear knowledge of the fact, automobile buyers are daily becoming more critical, more exacting and more insistent in their conclusions as to the character of the finish belonging to the surface of the car.

Aeroplanes in the Army

By William D. Ennis, M. E.

In view of the concentration of a division of the United States Army at San Antonio, Texas, and the interest that is being taken in aeroplanes to facilitate the work of the Intelligence Department, the article as here presented by William D. Ennis, Professor of Mechanical Engineering, Polytechnic Institute, Brooklyn, is offered as being timely. In noting the performance of an aeroplane, the experience thus gained, if compared mathematically with the requirement from the real service point of view, should end in the further elucidation of the puzzling situations. It is not the purpose here to attempt to subordinate the knowledge that has been learned by hard knocks to theoretical considerations.

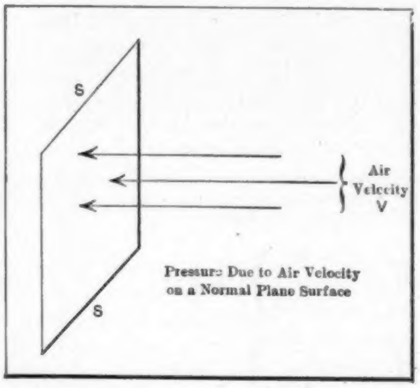


Fig. 1—Diagram used to make a point in pressure characteristics

NEXT to the automobile as the instrument of transportation in a war maneuver the aeroplane should be placed, because it is the device which in the hands of the intelligence department will serve in the obtaining of accurate topographical data and other intelligence, by means of which the forces may be directed with certainty, and the automobiles as they are employed in transportation work will be at their best. Experiments with actual aeroplanes have limitations, due to the fact that the experimenters can get no more out of the machine than there is in it, but while the experiments are going on, if the men in charge have access to broad information they are placed in a better position for efficient action, and in view of the present emergency it should not be out of place to present certain of the theoretical and deduced information which, in conjunction with the actual tryout of machines, will lead to greater activity. It is pretty well agreed that when a flat surface moves through the air, in a direction perpendicular to that surface, a direct pressure is exerted which may be computed from an expression in the form,

$$p = 0.00275\ Vo^2 = 0.00128\ V^2, \qquad \text{(I)}$$

where p is the pressure in pounds per square inch and Vo is the relative* velocity in miles per hour, or V is that relative velocity in feet per second. This holds for sea level and ordinary temperatures.

In Fig. 3 we have a curve showing the relation of pressure to velocity as defined by this equation. The pressure is at first slight, but it increases much more rapidly than the velocity.

If the flat surface and the air mutually impinge in a direction other than one at right angles with the surface the pressure is always less than that given by Equation I. Thus, in Fig. 2 let ab be an edge view of the surface and let V represent the resultant relative velocity. If the plane is standing still, the air is assumed to be blowing as indicated by the arrow. If the air is still, the plane is supposedly moving in the direction opposite to that so indicated. In either case a pressure is exerted against the plane which is due to and determined by this relative velocity. Such pressure always acts in a direction perpendicular to the surface of the plane and may be represented as P, Fig. 2. It is less than that which would be exerted were the plane moving while vertically situated at the same velocity in the direction directly opposite to that of the arrow P.

The relation of pressure P on such an enclosed plane to the pressure p of Equation (I) is determined by the angle of inclination made by the plane with its direction of relative movement. In Fig. 2 let this angle be B, according to the experiments of Langley and Duchemin,

$$P = p\left(\frac{2 \sin B}{1 + \sin^2 B}\right), \qquad \text{(II)}$$

if the moving plane is about square. If it is broader than it is long and moves in the direction of the lesser dimension (the "pterygoid rectangle" of Lanchester), then, according to Rayleigh and Gerlach,

$$P = p\left(\frac{(4+\pi) \sin B}{4+\pi \sin B}\right) \qquad \text{(III)}$$

The application of both equations is shown in Fig. 4. If for any given velocity p is 10 pounds per square foot, then for various angles the values of P are those shown by the curves.

The ratio of $\frac{p}{P}$ holds at any angle no matter what the velocity.

Consider again Fig. 3. The pressure P tends to push the plane upward and simultaneously to the left. The two effects may be

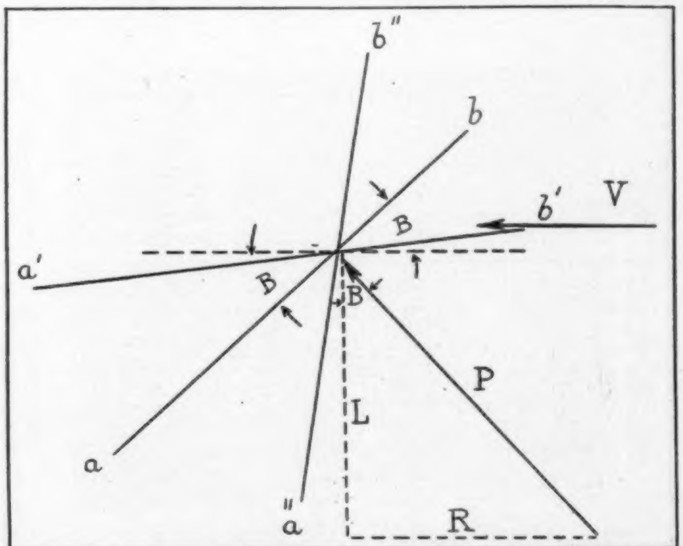


Fig. 2—Diagram of the forces showing how to deal with them

*By "relative" velocity is meant the sum of opposing velocities (or the difference of velocities in the same direction) of moving plane and air. Thus, in Fig. 1, if the air moves toward the left with the velocity V, while the plane s s moves toward the right with the independent velocity V_1, the relative velocity in Equation I is $V + V_1$. If both plane and air move toward the left, it is $V - V_1$ or $V_1 - V$, as the case may be.

relatively measured by drawing the horizontal and vertical lines R and L. If, originally, P had been drawn to some convenient scale, representing by its length the pressure which it indicates, then, to the same scale, the length of I would represent the lifting tendency of that pressure, and the length of R would indicate the number of pounds of resistance to horizontal forward movement (to the right) imposed by the pressure P.

If the plane ab were moving at a lesser angle (say in the position a'b'), then L being always drawn vertically and R horizontally, and P being always perpendicular to the plane, the ratio of L to R would increase. On the other hand, if the plane were swung into the position a"b", this ratio would greatly decrease, and ultimately, with the plane vertical, L would become zero and R would equal P.

It is the "vertical component of the normal pressure"—the force L—which sustains an aeroplane. All that is necessary is that the plane should move forward at some relative velocity while making some angle B with the horizontal. The value of L is, trigonometrically, since the angle between P and L is equal to B,

$$P \cos B, \qquad \text{(IV)}$$

a value which necessarily tends to decrease as B increases; but since the value of P is also dependent upon B (see Equations II and III) and increases with B (see Fig. 4) we cannot at once say that the sustaining force increases as the angle increases. By combining values in Fig. 4 and Equation IV, however, we obtain the complete expression for L (for square planes), viz.,

$$L = p\left(\frac{2 \sin B}{1 + \sin^2 B}\right)\cos B =$$

$$0.00275\ V_0^2\left(\frac{2 \sin B}{1 + \sin^2 B}\right)\cos B, \qquad \text{(V)}$$

which has been plotted for various angles in Fig. 4 to such a scale as makes $p = 10$. The value of L, therefore, seems to increase with the inclination of the plane until the latter reaches 30 or 40 degrees, and afterward to decrease. What does this mean?

Simply this, that the greatest sustaining force is exerted by an aeroplane when it is inclined at an angle of about 40 degrees with the horizontal, and since the total sustaining force depends also on the velocity (see Equation V), sustension in the air will become possible at the lowest speeds when such an angle of inclination is adopted. Why, then, do all aeroplanes fly at much less inclination, making a very slight angle only with the horizontal?

To answer this question we have only to consider the retarding force R, Fig. 3. This also varies with the inclination of the plane. For square planes it is, trigonometrically,

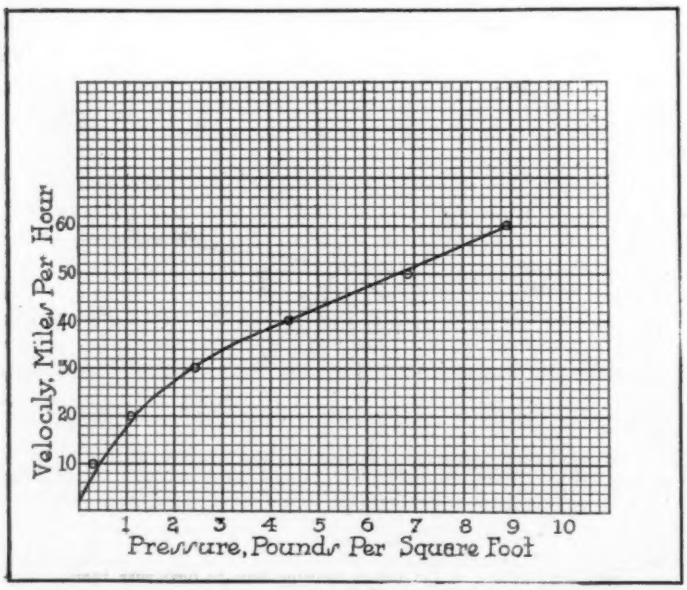


Fig. 3—Chart of the pressure, dealing with the velocity in miles per hour

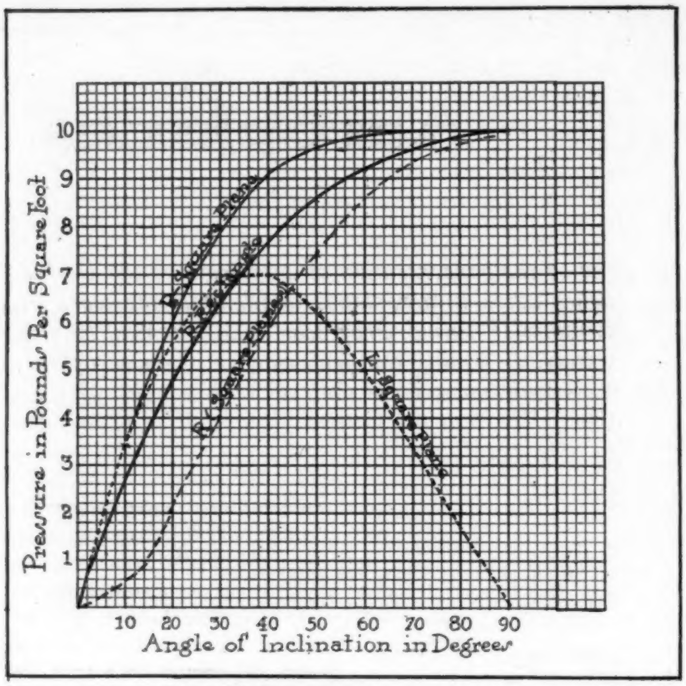


Fig. 4—Chart dealing with the pressures in pounds per square inch and the angle of inclination in degrees

$$R = P \sin B = p\left(\frac{2 \sin B}{1 + \sin^2 B}\right)\sin B =$$

$$0.00275\ V_0^2\left(\frac{2 \sin^2 B}{1 + \sin^2 B}\right) \qquad \text{(VI)}$$

which by plotting on Fig. 4 shows a steady increase with inclination. Now in an aeroplane it is not only desirable to sustain the weight without resorting to excessive velocities, it is also essential to consume the least possible amount of power. Approximately, least power (for a given weight) is consumed when the resistance is the least, so that our aim should apparently be to adopt that angle of inclination at which the ratio of sustaining to retarding force will be greatest, that is, $\frac{L}{R}$ should have a maximum value.

The curves in Fig. 4 show that L is just equal to R at an angle of 45 degrees, at any greater angle L is less than R. At an angle of 22 degrees L is about twice R; at an angle of 10 degrees it is nearly six times as great. The reason for adopting a very small angle is thus apparent. To ascertain somewhat more accurately just what that angle should be, the second set of curves (Fig. 5) has been plotted to an enlarged scale for angles between zero and 10 degrees. This diagram may be regarded as an enlarged reproduction of the lower left-hand corner of Fig. 4. Ratios of L to R are now as follows:

	L.	R.	Ratio
10	3.315	0.588	5.65
9	3.025	0.48	6.3
8	2.92	0.41	7.11
7	2.395	0.293	8.15
6	2.055	0.217	9.48
5	1.723	0.151	11.4
4	1.38	0.096	14.4
3	1.04	0.054	19.3
2	0.70	0.024	29.1
1	0.35	0.006	58.3

Apparently, then, the smaller the angle the better, but there are two reasons why in practice the angle is seldom much less than 5 degrees. One is that the machine moving at such slight angles is unstable, a very slight disturbance would suffice to produce a back somersault, so to speak. The other reason has to do with skin-frictional resistance.

Besides the direct resistance R, due to relative velocity, a very considerable obstruction is due to the gleders of particles of the air along the surfaces of the tails. This "skin friction" is in-

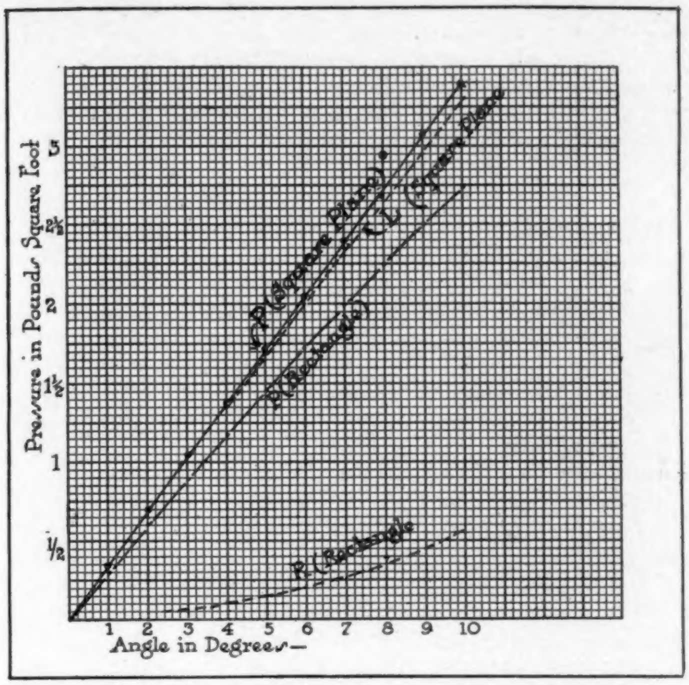


Fig. 5—Chart dealing with the pressure in pounds per square inch and the plane angles in degrees

dependent of the inclination of the plane, it varies with the velocity and with the dimension of the surface in the direction of flight. It is approximately correct to say that the resistance per square foot of supporting surface, with planes of usual dimensions, is about 1-146,000 of the square of the velocity in feet per second, or 1-68,000 of the square of the velocity expressed in miles per hour. It is, therefore, only about 1-93 the direct resistance of a normally moving plane, as given in Equation I (friction being exerted on both sides of the plane).

But if frictional resistance is small in proportion to the direct pressure experienced by a plane moving in a direction at right angles with its surface, it is by no means small in comparison with the directly resisting component R of the perpendicular force P on a greatly inclined plane. The table just given shows that at an angle of 5 degrees the value of R corresponding to a normal force p of 10 pounds is only 0.151 pounds. The skin friction at the same velocity would be about $\frac{10}{93} = 0.108$ pounds, or about two-thirds as much.

If we add to the values of R in the table the constant quantity 0.108, as representing the skin friction per square foot, we obtain the following:

Angle.	Total Resistance.	Rules of L to Total Resistance.
10	0.696	4.77
9	0.588	5.15
8	0.518	5.65
7	0.401	5.96
6	0.325	6.35
5	0.259	6.67
4	0.204	6.76
3	0.162	6.42
2	0.132	5.30
1	0.114	3.07

Showing that even on technical grounds the most economical angle of inclination is between 3 and 5 degrees, and that any lesser angle greatly decreases the carrying capacity in proportion to the power. A somewhat closer computation gives the following:

Angle.	P.	L.	R.	Total Resistance.	L ÷ Total Resistance.
3° 15′	1.13	1.13	0.064	0.172	6.60
3° 30′	1.22	1.22	0.075	0.183	6.68
3° 45′	1.30	1.30	0.085	0.193	6.74
4°	1.40	1.38	0.096	0.204	6.76
4° 15′	1.49	1.48	0.110	0.218	6.79
4° 30′	1.56	1.56	0.122	0.230	6.79
4° 45′	1.64	1.63	0.136	0.244	6.70

This shows clearly that the best angle for easiest traction is between 4 degrees 15 minutes and 4 degrees 30 minutes. The same angle will be nearly that of minimum power consumption. At this angle the skin frictional resistance is just about equal to the resistance directly due to wind pressure. Fig. 6 represents graphically the variations in lifting power and resistance at these small angles.

If a plane is to support a given weight, a necessary relation exists between this weight, the lifting force L per square foot and the whole area A of the plane in square feet. The relation is

$$W = L\,A, \qquad \text{(VII)}$$

where W is the weight in pounds, L is lifting force and A is in square feet. Since L varies as the relative velocity, we may write $L = c\,Vo^2$, c standing for the whole coefficient of Equation V, viz.,

$$0.00275 \cos B \left(\frac{2 \sin B}{1 + \sin^2 B} \right). \text{ Then}$$

$$W = c\;A\;Vo^2, \qquad \text{(VIII)}$$

and for a given weight, W,

$$A\,Vo^2 = \text{a constant}, \qquad \text{(IX)}$$

which may be regarded as the *fundamental equation of sustension* in an aeroplane.

Applications of the Analysis

The Wright aeroplane purchased by the government and made the subject of extended tests at Fort Myer, Va., carried a total weight of 1,000 pounds with an area of main surface of 520 square feet, while moving at 40 miles per hour. The motor was of 25 horsepower. The angle of inclination of the main planes was about 7 degrees.

The weight supported per square foot of area was therefore $\frac{1000}{520} = 1.92$ pounds. For the given velocity we obtain from Equation I,

$$p = 0.00275 \times 1600 = 4.4 \text{ pounds per square foot,}$$

and from tables given, for an angle of 7 degrees, $L = 0.2395 \times 4.4 = 1.05$ pounds per square foot. The machine has nearly twice the lifting power that our equations indicate. The excess is due to four causes (if we ignore the great effect of any slight error in the estimation of the angle):

(1) Equation III, for rectangular planes, fits this case more closely than Equation II for square planes from which the tabular value 0.2395 was derived. This former equation gives:

$$P = 4.4 \left(\frac{7.14 \times 0.12187}{4 + (3.14 \times 0.12187)} \right) = 0.871$$

$$L = 0.871 \times 0.99255 = 0.866.$$

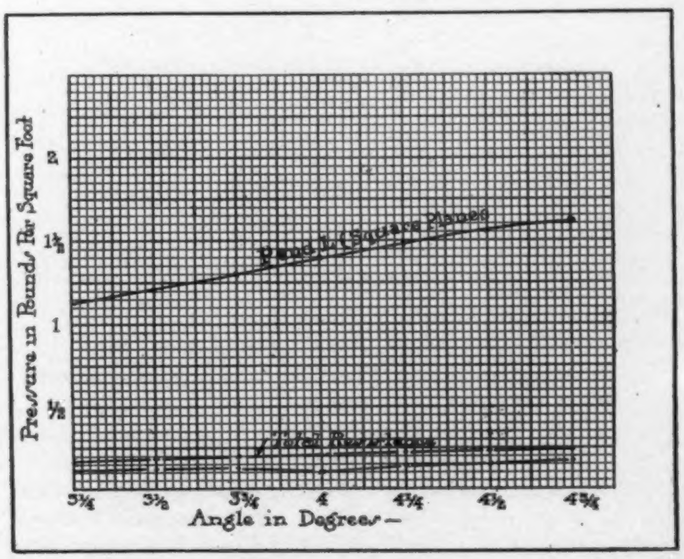
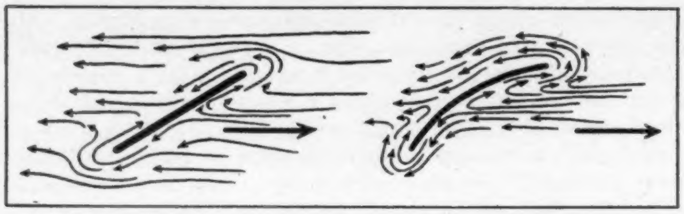


Fig. 6—Chart dealing with the pressures in pounds per square inch and plane angles, giving also the total resistance effects



Figs. 7 and 8—Concavity of the surface on its leading side makes it more difficult for the air currents to get around it and increases the pressure resulting from impingement of the air particles

which makes the case even worse than before, as far as conformation of the present analysis goes.

(2) The elevating rudder added 90 square feet to the whole area of horizontal planes. The angle of inclination of this surface is variable, its utility lying in the tilting of the main planes which it produces, but at the same angle of inclination as the principal surfaces it should produce a lifting effect about $\frac{90}{520}$ of that of the latter, increasing the value of L to about

$$\left(1+\frac{90}{520}\right) 1.05 = 123 \text{ lbs.}$$

(3) The constant term in Equation I is in doubt. Some make it 0.004 instead of 0.00275 for flat surfaces. Upon the value of this constant all of our computations depend. If 0.004 is correct, then we may expect L to be increased to

$$\frac{0.004}{0.00275} \times 1.23 = 1.79 \text{ pounds.}$$

(4) The planes are not flat, but arched, forming a concavity on the under side (see Figs. 7 and 8). This undoubtedly increases the lifting power, but how much is not definitely known. Our own calculations give some data. If we take the last value for L, based on Equation II and the constant 0.004 in Equation I, the arching adds (since the experimentally observed value of L was 1.92)

$$\frac{1.92 - 1.79}{1.79} = 7.28 \text{ per cent.}$$

to the lifting force. If we use Equation III instead of Equation II, the computed value of L is $\frac{0.866}{1.05} \times 1.79 = 1.477$ pounds, and the effect of arching is to increase the lifting force by

$$\frac{1.92 - 1.477}{1.477} = 30 \text{ per cent.}$$

But if we use 0.00275 as the coefficient for the constant term of Equation I, the augmentations due to concavity are $\frac{1.92 - 1.23}{1.23} = 56.1$ per cent. based on Equation II, and

$$\frac{1.92 - \left(\frac{0.866}{1.05} \times 1.23\right)}{\frac{0.866}{1.05} \times 1.23} = \frac{0.904}{1.016} = 89 \text{ per cent. based on Equation III.}$$

All that we can say, therefore, is that arching may increase the lifting power from 7 to 89 per cent. Someone has suggested the figure 25 per cent.

Sail Area and Velocity

Let us call the main sail area, roughly, 500 square feet and note that the velocity is 40 miles per hour. Then Equation IX shows that at a speed of 80 miles the area need be only 125 square feet, at 160 miles it would be only 31 1-4 square feet, at 320 miles less than 8 square feet, practically *nil*. On the other hand, if the speed drops to 20 miles, the area would have to be 2,000 square feet; if it is only 10 miles, the area would be 8,000 square feet. When we remember that large areas involve structural weakness unless excessive weight of bracing is contemplated it is easy to see why aeroplanes cannot run slowly.

Resistance and Power

For an angle of 7 degrees the wind pressure resistance per square foot is, from the table, $0.0293 \times 4.4 = 0.129$ pounds. The skin friction resistance is $4.4 \div 93 = 0.0474$ pounds, so that the total resistance to be overcome (considering the main planes only) is 520 (0.129 + 0.0474) 91.9 pounds. If we include the elevating rudder planes this becomes $91.9 \left(1+\frac{90}{520}\right) = 107.7$ pounds. The speed of 40 miles per hour corresponds to $40 \times \frac{5280}{3600} = 58.6$ feet per second, and since horsepower = (force in pounds × distance moved per second ÷ 550), the horsepower developed in propulsion is

$$\frac{107.7 \times 58.6}{550} = 11.4.$$

If the engine develops 25 horsepower, the efficiency from engine cylinder to thrust at the propeller is

$$\frac{11.4}{25} = 0.456$$

a reasonable figure, the propellers being geared down from the motor and propeller efficiencies usually ranging not over 60 per cent.

Power and Radius of Action

As has been stated, both direct and frictional resistance vary about as the square of the velocity, so that the power consumed varies about as the *cube* of the velocity. The machine in question could carry fuel and supplies sufficient for a 125-mile flight. Suppose the average horsepower actually developed, at 40 miles per hour, to have been 25. Then for a speed of 80 miles per hour the horsepower would need to be $\left(\frac{80}{40}\right)^3 \times 25 = 200$, while for a speed of 20 miles per hour only

$$\left(\frac{20}{40}\right)^3 \times 25 = 3\ 1\text{-}8 \text{ horsepower}$$

would be necessary, but this would be an impossible speed for the machine in question, one that would reduce its carrying capacity to

$$\left(\frac{20}{40}\right)^2 \times 1000 = 125 \text{ pounds.}$$

If the machine can carry sufficient fuel and other supplies to develop 25 horsepower for 125 miles at 40 miles per hour, it can travel for $\frac{125}{40} = 3.125$ hours. When developing eight times this, or 200 horsepower, the same weight of fuel, etc., would carry it only one-eighth as long, or 0.391 hour, in which time it would travel 0.391×31.25 miles, since with the increased power the speed is increased to 80 miles per hour. The *radius of action* has, however, been decreased, the ratio of possible action varying inversely as the square of the velocity if the total load remains constant. High speeds must therefore be associated either with a reduction of weights or a decreased field of action and time of flight.

Michigan Trying to Fix Standards

Attempt to Legalize U. S. Standard Threads

House Bill No. 224, File No. 154, in the State of Michigan, is the designation of a bill that has for its purport the standardization of the taps and dies by which bolts and nuts are threaded, as originally brought out by William Sellers, of Philadelphia, and adopted by the army and navy many years ago. This standard is in common use in machinery work, but it was found to be ineffectual for automobile service, and the Mechanical Branch of the A. L. A. M. established a new standard with finer threads, which experience proves is better. A mysterious bill has appeared in the Michigan House, was passed, and is now before the Michigan Senate. Automobile makers in Michigan are confronted by a serious dilemma.

THE manufacturers of automobiles in the State of Michigan are wrought up owing to a mysterious bill that has been introduced in the Michigan House as House Bill No. 224, File No. 154. This bill was introduced by Mr. Wolcott on February 1, 1911, referred to the Committee on Agriculture and reported favorably March 7, ordered printed and placed on the general order. The context of the bill is as follows:

"A bill to regulate the sales of vehicles, implements, machinery and mechanical tools in this State, and providing a punishment for violation of this act.

"The people of the State of Michigan enact:

"Section 1. On and after the first day of January, nineteen hundred and fifteen, it shall be unlawful for any person, firm or corporation, by himself or itself, his or its agents or attorneys, to manufacture, sell or offer for sale within this State any vehicle, implement, machinery or mechanical tools in the manufacture of which other than United States standard taps and dies are or have been used or employed. Provided, however, that this act shall not apply to the selling or offering for sale any such vehicles, implements, machinery or mechanical tools that have been manufactured prior to the first day of January, nineteen hundred and thirteen.

"Section 2. Any person, firm or corporation violating any of the provisions of this act shall for each violation be deemed guilty of a misdemeanor, and upon conviction thereof be punished by a fine of not less than ten dollars nor more than ninety days, or both such fine and imprisonment in the discretion of the court."

Michigan Manufacturers' Association Up in Arms

In its opposition to the terms of this bill, which on the face of it has the intent to make out of an honest manufacturer a criminal if he adheres to the practice which he knows to be safe and proper, in the face of the fact that the sponsor for this bill, not knowing that there are serious objections to the United States standard of taps and dies, the association presents a few of the objections as follows:

(1) On account of vibrations in machinery, screws and nuts work loose, consequently it is necessary to have finer threads than the United States standard provides for.

(2) It is not always possible to use the given diameter with the given United States standard pitch, because the available room and the thickness of the metal will not allow it.

(3) Repair parts would be so complicated and expensive and unsatisfactory that it would be extremely unjust to everybody.

(4) The formula for the pitch of United States standard threads is not satisfactory for fine threads, consequently it is necessary to depart from this system.

(5) Variations in workmanship in different shops prohibit the screw made in one shop from taking the place of a screw made in another shop.

(6) In the use of tubing that is thin and of a large diameter the United States standard thread would be too coarse, as this thread calls for a given depth in proportion to the pitch, and for a large diameter the depth of the thread would be more than the thickness of the tube.

(7) It would be impossible to build satisfactory machinery if no other screws and pitches were used than the United States standard.

(8) If the United States standard would satisfactorily meet all the conditions that arise in building machinery, machine builders would voluntarily insist on using this system and it would not be necessary to pass a law enforcing its use, because the machinery builder is always looking for the best and safest method of construction, knowing that human lives are usually at stake.

(9) Examples can be shown where it would be impossible to use the United States standard system in machinery construction.

The association calls attention to the fact that this bill has passed the House and is pending in the Senate, having been rushed through before its importance was fully appreciated by those who have the interest of the community and the manufacturers at heart. It is recommended that every one who is in favor of good automobiles shall write to Senator Lawrence Snell, whose address is Lansing, Mich., and whose position as chairman of the Committee on Agricultural Interests is so commanding that to convince him of the error of the way that this bill indicates will go a long way toward the suppressing of such an ill-advised measure.

United States Standard Has Not Been Legalized

There seems to be quite a number of people who labor under the impression that the Sellers screw thread, otherwise known as the United States standard, has been standardized by the United States Government and made a legal standard. It was in 1864 that a committee of the Franklin Institute recommended the adoption of the system of screw threads and bolts, which was then devised by William Sellers, of Philadelphia. At a subsequent date this system was taken up by the army and navy departments of the United States, so that it was not out of place to refer to it as the United States standard of screw threads.

But there never has been a time when the manufacturers regarded it as incumbent upon them to follow army or navy practice, although to a very considerable extent in machinery building the Sellers thread is in vogue. When automobile work was taken up it was soon found that the relatively coarse threads used in ordinary machinery work were not suitable for automobile purposes, and after the organization of the mechanical branch of the A. L. A. M. a committee undertook to determine what should be the number of threads per inch for the different diameter of bolts and cap screws, and a vast amount of research, under capable conditions, brought about the A. L. A. M. standard. Moreover, several years of experience with this standard goes to show that it is free from the defect that resides in the Sellers standard in automobile work.

Automobile club house in Le Mans, France, with Commission starting to inspect the course.

One of the bad turns at the village of Pontlieue, near the start

Dip out of Mulsanne, about 12 miles from the start, on the French Grand Prix Course.

La Sarthe pour

A definite date has been settled for the holding of the Grand Prix de France. The entire course will be barricaded to protect the spectators in case of accident and prevent them from interfering with the progress of the race by encroaching on the course.

THE French have at last awakened to the fact that to stay in line with the other nations competing for the world's commercial supremacy in matters automobile it is necessary to do something more than make the cars. In a manner similar to that displayed in the case of the Paris Salon two years ago, history is repeating itself in the Grand Prix, that, owing to the greed of the French, superseded the old Gordon Bennett, where three cars from every nation fought for the then blue ribbon of the road. The French won two years in succession, and then instituted the Grand Prix, which allowed three cars of the same manufacture to compete, giving them about a ten to one chance, as most of the leading French makers at that time went in for racing extensively. Like a small boy who loses, they decided to give up racing when an Italian took the prize away from them, and any racing that has been carried out has been individual efforts.

This year the Automobile Club de la Sarthe has taken the initiative and has decided, so the advices from abroad have it, to hold the race, no matter how few the entries, and the outlook at the beginning of the year was not promising, as French makers decided not to participate.

The date has been recently fixed for the race to take place on Sunday, July 2, and the route chosen is a circuit of 32½ miles. The course is a triangular one, starting a short distance outside Le Mans, in the village of Pontlieue, shown in Fig. 2, passing through Mulsanne, shown in Figs. 3 and 4, along the main road to Tours. Mulsanne is a small village of 600 inhabitants, about 12 miles from the start, and the first turn is made at Ecommoy, where a sharp turn to the left will have to be negotiated. A good broad road leads to the acute angle turn at Grand Luce, whence the racers will have practically a straightaway to the start, making the last side of the triangle about 11 miles.

The illustrations give an excellent idea

le Grand Prix

of the type of roads over which the car will travel, and it is considered the fastest that has ever been adopted for an automobile race. Arrangements for the erection of grand stands have been completed, which will be at the start at Pontlieue, the cost of which will be borne by the Municipal Council of the town of Le Mans, and it is stated that contracts have been accepted for the course to be encircled with barriers. The type of road is typically French, with the tall trees all along the route, and although the roads are all that could be expected, nevertheless if a car runs off the course through any unavoidable circumstances at speed there is little chance of the unfortunate driver missing one of the trees, as in the case of the Paris-Madrid, which, at the time, was considered a holocaust in view of the fact of the number of cars that hit trees, including one of the brothers Renault. Cars since that day have improved, and the drivers become more skilled.

The race will be open to two categories of cars; the first is limited to vehicles fitted with four-cylinder motors, with a maximum bore of 110 millimeters (3.93 inches) and a maximum stroke of 200 millimeters (7.97 inches) and the second a free-for-all, without any limitation as to power or weight. For the former the following entries are expected: Hispano Suiza, the Spanish car that won last year's small car race at Boulogne; Peugeot, Rolland-Pilain; Excelsior, a Belgian product; Opel and Benz, from Germany, and the Italian F.I.A.T. It has been semi-officially announced that the De Deitrich cars will figure in the big event, and as Hemery, the Benz driver, has been on the circuit for several weeks, there is every indication that this firm will also race. England has not so far shown any indication of taking part, but Albion was always slow in coming forward, but perhaps some wealthy amateur at the last moment will come forward and thereby give the event a more international character.

The barrier question is one of great importance, which shows that the French think more of the average citizen and his protection than they do of the amount of money to be made out of the race by the promoters.

Two makes of American cars are reported intending taking part, one in the hands of an amateur.

But up to the present the official entries have not been lodged with the club.

Turn outside of Mulsanne; good road, but dangerous on account of the trees.

Narrow neck in St. Mars d'Outille through which the cars will have to pass.

The S bend at Moulin de Couleve, giving a splendid idea of road conditions.

S. A. E. Advocates Standardization

Cardinal Virtues Kept in Wrong Store Room

Great familiarity with the systems that are being employed in manufacturing establishments brings to light the placing of important responsibility on the shoulders of relatively unimportant men. It is pointed out that if a draftsman at $18 per week is permitted to browse around unshackled by a fixed environment the product of the establishment will be as good as the $18 per week man can make it, and the president of the company, if he receives $50,000 a year, will be delivering to the board of directors an $18 per week result. All of this comes about in the absence of fixed standards, remembering, of course, that the draftsman will have to deliver something or he will lose his job, not forgetting that the president of the company must take what the draftsman gives him, in the absence of instructions emanating from the proper source.

HISTORY, as it portrays the automobile industry, indicates a vast undertaking, and thousands of ramifications showing how originality cropped out at every turn, but there has been too little of what might be designated as concerted effort, and many of the things that ran into money without showing an equal measure of profit were due, not so much to their lack of value, but to the fact that they were inharmoniously arranged. When the Society of Automobile Engineers came into vogue, not forgetting that the Mechanical Branch of the A. L. A. M. took up the burden at an earlier date, the effort to fix upon a set of standards was started, and the good work has been going on with increasing impetus from that day to this. Moreover, the progress that is being made can be no more fittingly described than to state that the society has grown in a few short years from a little band of pioneers to 800 of the great engineers of the automobile industry, with every indication that the remaining members of this fraternity will be under the flag of the society and standardization within the year.

It is a little difficult to get companies to understand the necessities of the time, it being the case that some of the heads of concerns harbor the fear that standardization will dwarf ingenuity, and others in the manufacturing part of the industry wish to have their fling. The probabilities are that the opponents of the standardizing process are too busy to analyze the situation, and they overlook many important details. In railway work it was not so many years ago when it was utterly impossible for the cars of one company to roll on the tracks of another, and it was a simple thing to go out and find a tunnel so narrow that it would only accommodate the cars of the particular road that projected the tunnel, and down through the plants where railway equipment was made every workman fiddled on his own string, and every railroad company was on the verge of bankruptcy, due to the fact that none of them were manufacturing anything.

The automobile industry is in far better shape without standards than the railroad companies found themselves in their time, due to the fact that workmen have arrived at a more or less fixed understanding as to the best way to perform operations, and instruments of precision are now to be had from reliable sources, so that in the ordinary course in a shop the several classes of operations are conducted in the light of excellent experience.

But the men in the shop have to do the work as it is indicated on working drawings, and these instructions to the workmen, which is all they are, emanate from a drawing office, and the presumption is that the draftsmen who do the work of getting out these drawings are suitably instructed, let it be said, by the board of directors through the executive committee, which talks it over with the president of the company, and so on down the line, reaching the chief engineer in the course of time, who tells the chief draftsman to tell the draftsmen what to do.

If the board of directors can get what it wants under such conditions it will be because the organization is one of the greatest intelligence. But if there should be a slip or two, as the story slides down from its eminence to the $18 a week man who toils on a drawing board, it should not be considered a nine days' wonder.

At a matter of cold hard fact, the man who gets the most money for his services is the one who has the least to do with the contriving of the apparatus that is to make fame for the company. This may not be true in the well-directed establishments, but it was entirely so not so long ago in the automobile business, and examples of this way of doing automobile business will not be hard to find right now.

In the railway business, when the president of the company orders a thousand freight cars, his order covers the building of the cars to the minutest detail. He does not have to reiterate all the statements that would be necessary in the describing of the freight cars as they are to be delivered, because all such matters are disposed of in the specifications of the master car builders, and the president of the company can tell beforehand just what he will receive in all particulars, taking no greater pains than is required by prying open the covers of the book of specifications as they are standardized.

In the automobile business the president of the company will be the head of a most enlightened establishment if he can be sure that the draftsmen, who actually make the working drawings by which the product is fashioned, are so bound down by tradition and established methods whereby the things that go into the makeup of the product will have the sanction of usage.

The most recent discussion of this important problem as it emanates from the leaders of the industry has for its foundation the standardization of the little things and the raw materials, fixing limits of tolerance and affording to the draftsman the character of information that will permit them to go ahead with their work, accomplishing it in the shortest possible time, instead of retaining the position of "free lance," exercising their personal inclination, the end of which is always the same.

If there are 20 draftsmen in a room, and each of them is given the task of making the working drawings for a live rear axle, the fact that they are all in the same room, and each of them is given precisely the same instructions, will have no bearing whatever upon the result that will come from their effort—there will be 20 kinds of live rear axles when they get through.

Is it not time to take into account the simple situation—one of these draftsmen would suffice for the whole purpose were he properly guided, and instead of using 20 draftsmen for 20 kinds of axles there would be one draftsman who would make the one kind that is desired, after which it may be duplicated any number of times.

But even in the places where the draftsmen are fairly guided

by officials of competence and where supervision is intelligent and persistent, there are hundreds of things that have to be left to the judgment of the men in the course of a year, in the absence of standards to go by. Moreover, the men who direct the work will issue their instructions in one direction the "morning after," and they will be entirely different when they have corned-beef and cabbage for dinner, and the hue that they will take on at the end of a busy season cannot even be imagined.

In the final sum-up, although it is not flattering to say so, the man who directs the work is more in need of standards to guide him in his efforts than the draftsmen who perform the services. A man is given the position of director of the work because he is a man of ideas, judgment, and discrimination, but the very fact that he is a man of ideas requires that he be guided by precedent, taking into account the part of his previous experience that is worth crystallizing, it being the case that his ideas will be working with vivacity when his judgment is sound asleep.

The illustration as here afforded will suffice to bring home to those who are most interested in the future of the automobile business the fact that the man who makes the drawings, in other words, the workman, should be compelled to do the things that are wanted, rather than to depict the ideas that float to the top in his fertile brain. Moreover, it is scarcely to be expected that all the cardinal virtues are to be had for the price of $18 per week, and again it strikes one as passing strange that the draftsman is to receive such a small stipend for his services if he is to be expected to proceed along unrestrained lines, ending up with a car that is so well made in all particulars that it will support the presence of a $50,000 a year president, and a staff of stars. The automobile business is in need of the big man and the capable staff, but there should be some way by which the big man's thoughts will reach the workman, and be crystallized without having them contaminated by the versions of those who are merely called upon in an executive capacity—the whole situation spells standardization.

SHALL THE $18 PER WEEK DRAFTSMAN BE EXPECTED TO ANTICIPATE THE WANTS OF THE $50,000 PER YEAR PRESIDENT?

Florida Beach Races Finish

Four-day meeting concluded on Friday was scene of some fast work and interesting sport. Nationals win eight events. Recently reinstated cars fail to show speed. Marks set high at two hitherto unrecognized distances. Few old records were in danger at any time during the quadruple session.

JACKSONVILLE, FLA., April 3—The beach meet on the Atlantic-Pablo course came to an end on Friday, when only one event was decided, the feature race of the meeting at 300 miles. This was won by the Pope-Hartford entry driven by Disbrow from a field consisting of six other starters. There was no recognized record for the distance before this race and the winning car made a trifle better than 77 miles an hour.

The fields throughout the meeting with few exceptions were small, but several of the races were well contested. The summary of the last three days is as follows:

WEDNESDAY, MARCH 29

First Race, Five Miles, 161-230-Inch, Class B.

Car.	Driver.	Position.	Time.
Warren-Detroit	Tower	1	4:24.12
Warren-Detroit	Evans	2	4:37.53
Lancia	Rouse	3	......
Cole	Tucker	4	......
E-M-F	Robertson	5	......

Second Race, Five Miles, 231-300-Inch, Class B.

Mercer	Hughes	1	4:14.55
Cole	Wilson	2	4:45.92
Cole	Tucker	3	5:16.12

Third Race, Ten Miles, 301-450-Inch, Class B.

National	Merz	1	8:36.70
National	Wilcox	2	......
Pope-Hartford	Disbrow	3	......

Fourth Race, Ten Miles, 231-300-Inch.

Cole	Wilson	1	8:16.38
Mercer	Hughes	2	8:25.28

Fifth Race, Ten Miles, Class D (Non-Stock).

National	Wilcox	1	7:00.00
Buick	Burman	2	7:40.27
Pope-Hartford	Disbrow	3	7:49.96

Sixth Race, Ten Miles, Handicap, Class D (Non-Stock)

Mercer	Hughes	1	10:10.50
Cole	Wilson	2	10:14.14
Pope-Hartford	Disbrow	3	10:30.78

Seventh Race, Ten Miles, Handicap, Class D (Non-Stock).

National	Wilcox	1	10:09.63
Pope-Hartford	Disbrow	2	10:09.99
Cole	Wilson	3	10:28.30

THURSDAY, MARCH 30.

First Race, Five Miles, 161-230-Inch, Class C (Non-Stock).

E-M-F	Witt	1	4:20.10
Warren-Detroit	Tower	2	4:25.00
Lancia	Rouse	3	4:52.30
Cole	Tucker	4	4:53.00
E-M-F	Cohen	5	5:03.25
Warren-Detroit	Evans	6	7:52.00

Second Race, Five Miles, 301-450-Inch, Class B.

National	Wilcox	1	3:56.82
Mercer	Hughes	2	4:18.98

Third Race, Ten Miles, 161-230-Inch, Class B

Warren-Detroit	Tower	1	9:10.52
Lancia	Rouse	2	10:13.14
Cole	Tucker	3	10:38.74
Warren-Detroit	Evans	4	11:42.70

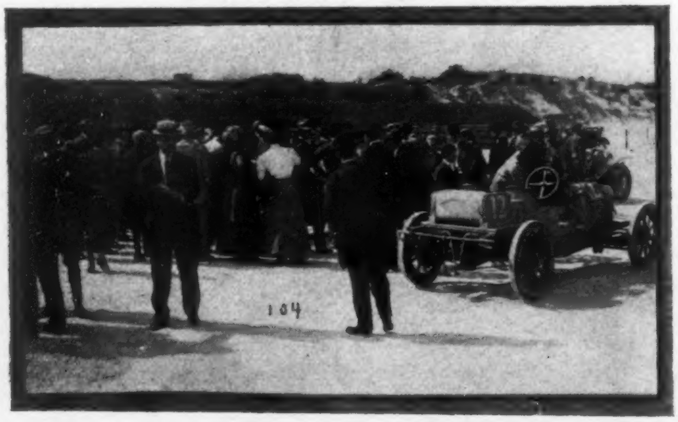


Fig. 1—Scene on the beach during the races, showing the grand stand in the background, which was not well patronized, although large crowds attended

Fourth Race, Ten Miles, Under 600 Inches (Non-Stock.)

Car.	Driver.	Position.	Time.
Pope-Hartford	Disbrow	1	7:42.39
National	Wilcox	2	7:54.21
National	Merz	3	8:09.32
Marquette-Buick	Haycroft	4	8:46.25
Benz	Burman	Did not finish	

Fifth Race, Twenty Miles, Class D (Non-Stock).

Buick	Burman	1	13:11.92
Pope-Hartford	Disbrow	2	15:24.52
National	Merz	3	16:24.21
National	Wilcox	..	......

Sixth Race, Ten Miles, Class D (Non-Stock).

Lancia	Rouse	1	10:14.79
Cole	Wilson	2	10:15.00
Pope-Hartford	Disbrow	3	10:16.00
National	Merz	4	10:24.50
Marquette-Buick	Haycroft	5	10:25.00
National	Wilcox	6	10:30.82
Cole	Tucker	7	11:20.83
E-M-F	Witt	8	11:31.60
Darracq	Burman	Did not finish	

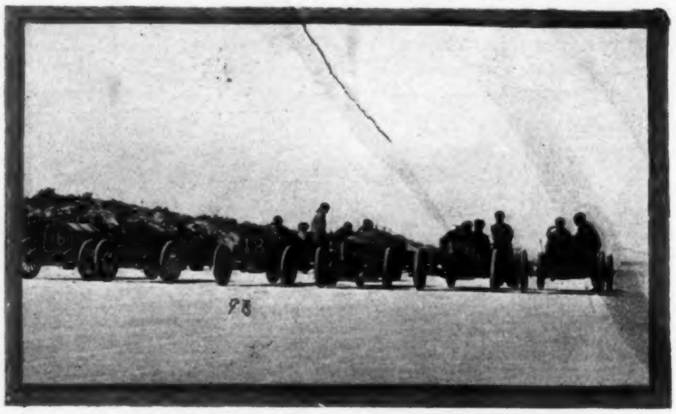


Fig. 2—Start of one of the hotly contested races

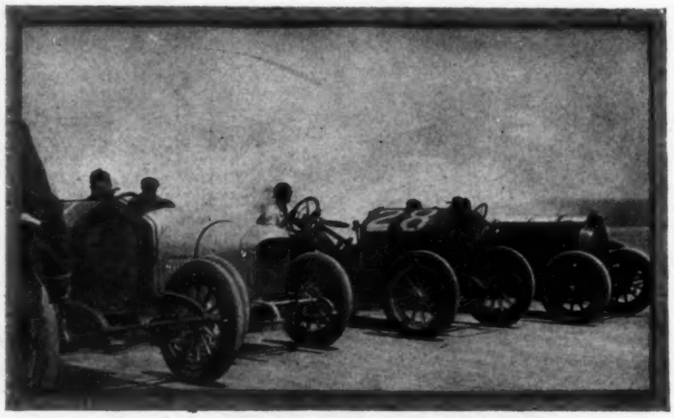


Fig. 3—Start of the ten-mile race for big cars

FRIDAY, MARCH 31.

First Race, 300 Miles, Class E (Non-Stock).

Pope-Hartford	Disbrow	1	3:53:33.50
National	Merz	2	4:15:19.00
Mercer	Hughes	3	......
Case	Strang	4	......
National	Wilcox	5	......
Cole	Wilson	6	......
Marquette-Buick	Haycroft	7	......

The rest of the program was declared off.

Quakers Select Roadability Prizes

PHILADELPHIA, April 3.—The prizes to be awarded participants coming nearest to the secret time schedule agreed upon for the Quaker City Motor Club's social run to Atlantic City on Saturday, April 29, have been selected by the committee named for that purpose. First prize will be a large mahogany mantel clock; four additional prizes of large silver loving cups of original design are also to be awarded. In addition it is planned to give a souvenir in the shape of a small cup to each entrant as a memento of the occasion.

Elgin Race Contracts Signed

CHICAGO, April 3.—Consent of the property owners to use the Kane County circuit for the 1911 National Stock Chassis Road Races has been secured and the Elgin Automobile Road Racing Association and the Chicago Motor Club have signed the contract that makes them partners in the enterprise, the same as last year, so everything looks promising for the renewal of the big event on August 25 and 26. The contract was signed last Thursday night, when the Elginites came to Chicago with all the frontage consents in their pockets.

In general the contract between the two organizations is the same as last year except that the Chicago Motor Club agrees to divide the entry fees on all nominations in excess of thirty.

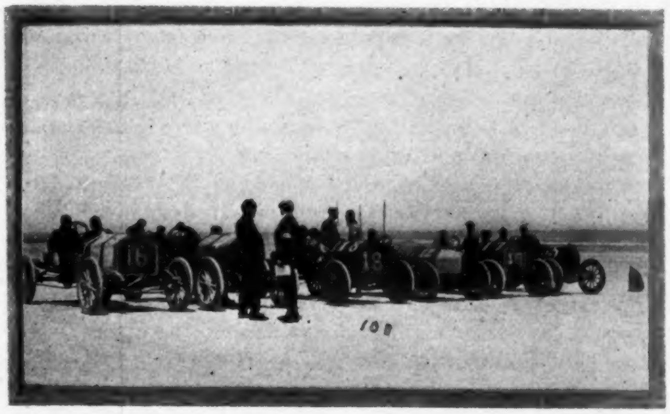


Fig. 4—Line-up of the ten-mile Class D free-for-all

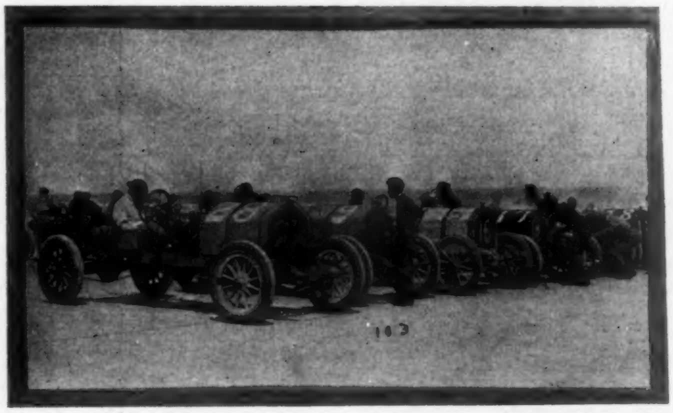


Fig. 5—Start of the ten-mile Handicap Class D

Last year the Chicago club took the fees and the Elginites had everything else. Before the terms of the agreement were finally decided upon there was much haggling over the remuneration to be received by the agriculturists for the use of the roads abutting on their several holdings.

In return the Elginites agree not only to improve the course but to put up a better grandstand. The stand will be higher from the ground, so that a better view of the course may be had; it will be set on an angle from the road and there will be a row of boxes at the top from which a view of both legs of the course may be had. The home stretch is to be widened so that three cars may run abreast, the bumps taken out between Udina and the tape, and the back stretch improved where necessary. There will be six days of practice this years instead of ten, and the races will start at 11 instead of 10 o'clock. Practice will be for two hours daily, between 11 A. M. and 1 P. M., and it is hoped that the State militia encampment will be held at Elgin in August, which would give the road race association 5,000 soldiers for patrol work. In addition efforts are being made to oil the road between the city limits of Chicago and Elgin in order to give spectators traveling to Elgin a country boulevard which will be free from dust.

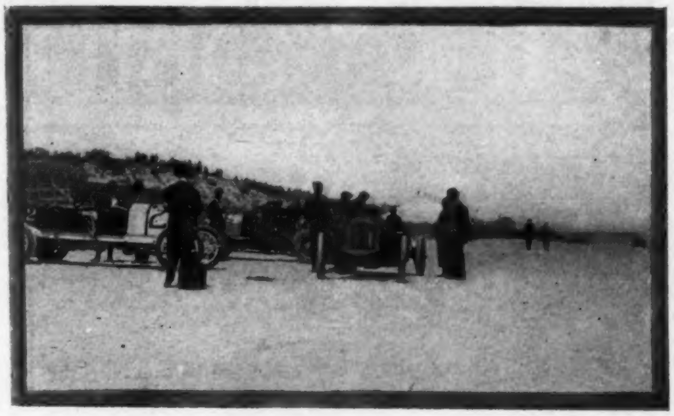


Fig. 6—View of the beach course during the progress of a race

Calendar of Coming Events

Catalogue of Future Happenings in the Automobile World That Will Help the Reader Keep His Dates Straight—Shows, Race Meets, Runs, Hill Climbs and Other Events.

SHOWS AND EXHIBITIONS.

Apr. 1-Apr. 8.....Pittsburg, Fifth Annual Show, Duquesne Garden; Second Week, Commercial Trucks, Automobile Dealers' Association of Pittsburg, Inc.
April 12-15.......Sioux Falls, S. D., Annual Show.
April 26-29.......Utica, N. Y., Annual Show, State Armory.

RACE MEETS, RUNS, HILL-CLIMBS, ETC.

April 8-9..........Los Angeles, Cal., Twenty-four Hour Track Race, Los Angeles Motordrome.
April 20-22........Lancaster, Pa., Three-Day Endurance Run, Lancaster County Auto Trade Association.
April 22..........New York City, Commercial Vehicle Parade, Motor Truck Club.

April 22..........Redlands, Cal., Annual Hill Climb.
April 29...........Guttenberg, N. J., Track Races.
Date indefinite.....Oakland, Cal., Track Races, Oakland Motordrome.
Date indefinite.....Shreveport, La., Track Races.
April 29..........Philadelphia-Atlantic City Roadability Run. Quaker City Motor Club.
May 16-19........Washington, D. C., Four-Leaf Clover Endurance Run. Automobile Club of Washington.
May 25...........Chicago, Ill., Fuel Economy Test, Chicago Motor Club.
May 27-31.........Chicago, Ill., Five-Day Tour to Indianapolis, Chicago Automobile Club.
May 29-31........Chicago, Ill., Tour to Indianapolis, Chicago Motor Club.
May 30............Indianapolis, Ind., Five-Hundred-Mile International Sweepstakes Race, Motor Speedway.
June 19-25........Glidden Tour, Washington, D. C., to Ottawa, Canada.
June 22...........Algonquin Hill Climb, Chicago Motor Club.
Aug. 25-26........Elgin, Ill., National Stock Chassis Road Race, Chicago Motor Club.
Oct. 9-13..........Chicago, Ill., Thousand-Mile Reliability Run, Chicago Motor Club.

FOREIGN FIXTURES.

April 16-23........Prague, Austria, Annual Show.
April 23-28........Modena, Italy, Touring Car Contests.
May 1-15..........Turin, Italy, Automobile Salon.
May 7............Sicily, Targa Florio Road Race.
May 14...........Barcelona, Spain, Catalona Cup Road Race.
May 21...........Ries, Austria, Hill-Climb.
May 25...........Meuse Hill-Climb, Belgium.
May 25...........Le Mans, France, Touring Car Kilometer Speed Trials.
May 28...........Le Mans, France, Hill-Climb for Touring Cars.
May 28...........Start of Touring Car Reliability Trials in Germany.
June 1............Bucharest, Roumania, Speed Trials.
June 4............Trieste, Austria, Hill-Climb.
June 18...........Boulogne, France, Voiturette and Light-Car Road Races.
June 25...........Sarthe Circuit, France, Grand Prix of Automobile Club of France.
June 25-July 2....International Reliability Tour, Danish Automobile Club.
July 5 to 20.......Start of the Prince Henry Tour from Hamburg, Germany.
July 9............Susa-Mont Cenis Hill-Climb, Italy.
July 13-20.........Ostend, Belgium, Speed Trials.
July 21-24........Boulogne-sur-Mer, Race Meet.
Aug. 6............Mont Ventoux, France, Annual Hill-Climb.
Sept. 2-11.........Roubaix, France, Agricultural Motor Vehicle Show.
Sept. 9...........Bologna, Italy, Grand Prix of Italy.
Sept. 10-20........Hungarian Voiturette and Small-Car Trials.
Sept. 16...........Russian Touring Car Competition, St. Petersburg to Sebastopol.
Sept. 17...........Semmering, Austria, Hill-Climb.
Sept. 17...........Start of the Annual Trials Under Auspices of *l'Auto*, France.
Oct. 1............Gaillon, France, Hill-Climb.

THE AUTOMOBILE

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STANDARDIZATION, as the problem of the automobile, is being hastened by legislative enactment, due to the fact that the owners of cars are showing some impatience. It will be impossible for the builders of automobiles to go on claiming that their products are standardized if it is not so. When a purchaser writes his check in payment, and he receives an automobile in exchange, if the car is not exactly as it may have been represented to be, the purchaser will be dissatisfied; nor does it matter whether or not the car is capable of rendering good service; the fact remains that it is not as represented. The best automobile for any man to select is the one that will do the work required of it, provided it can be repaired from time to time, as the occasion requires, promptly and at a fair cost. It will not be possible to keep the cost of repairs down unless the automobile bears some relation to the parts that may be had upon the market with which to make the repairs. The present activity of the Michigan Legislature is largely due to a certain restlessness on the part of the owners of automobiles who seem to harbor the impression that they should be able to get a bolt or a stud or a screw from some source or other in substitution for a defective one, and they labor under the impression that it is too much to have to wait for several days, perhaps, while a willing repairman whittles out a special bolt by hand. The Society of Automobile Engineers is working upon these standardization problems, and the owners of automobiles may rest assured that good progress is being made, and that the builders of cars, who are supporting the society in this large endeavor, sanction the work.

* * *

IN presenting one phase of the Spring preparation for a campaign of automobiling during the coming season, the figures developed by investigation offer food for serious reflection in quite a few respects, and the fact that the "service departments" of the various companies have grown to large proportions in the metropolitan districts, such as New York City, may be commented upon from several angles by those who are imbued with the habit of viewing things in retrospective; but instead of there being only one subject from the point of view of logical treatment it has been found impossible to treat the matter with justice in a single article. There is ample evidence to show that the various companies are fitted out to give to their respective clientèle that prompt and efficacious service which is necessary to the owner of a car in order that the value of his investment may not be precipitately reduced. Beyond this point it will occur to the man of affairs that the service end of the automobile business is growing at a marvelous rate, and to vast proportions. This gives employment to many men, and as skilled artisans they are offered the opportunity to make a good living.

* * *

SHOULD there be an inclination on the part of the critical automobilist to ponder over the size of some of the items of depreciation in automobiles, it is suggested that the criticism should be peppered with intelligence, and that the blame, if such there is, should be put where it belongs. That some of the items are a little excessive is rather too apparent to warrant denial, and it is this part of the subject that will have to be separated out, and after it is investigated sufficiently it may be presented with the understanding that it will make good reading for the man who has a bent for action. There are some things about the automobile business that have failed to progress with the times. Inertia seems to have fastened its fangs in the flesh of some of the undertakings, and it is only by looking backward that we are enabled to see wherein progress is being made, and how this undue component of inertia is being smoked out. It is fitting to discourage the idea that there is anything of a "game" about the automobile business, and the part of the industry that seems to have lagged behind has nothing to do with the situation fundamentally. Back in the plants where the cars are made the men who perform the respective tasks are skilled, sincere and enthusiastic, and the business methods of the companies are progressive, keen and eminently fair, and it must be that the fellow who goes around referring to the industry as a "game," which he must "play" for the money that he is unwilling to work for, is the microbe that festers in the epidermis of maker and user with equal impartiality.

* * *

THE appointment of a board of review whose decision shall be final in contest matters, the board to be composed of gentlemen of high standing in the community who are in no way connected with the making of automobiles or with the running of contests, is the move that will clear up the situation which has been at the bottom of contest troubles all along.

Glidden Trophy in Court

Judge Marean Makes Sport Precedent

Takes Jurisdiction Over Head of A. A. A.

Premier-Chalmers dispute over Glidden Trophy is on hearing before Judge Marean, of the New York Supreme Court, at Brooklyn. Without making any specific ruling, the court took jurisdiction of the case, and this action creates a precedent, as heretofore sporting matters have been trusted in their decision to the duly constituted sport governing bodies. The A. A. A. made rules for the tour and overruled them in deciding the case. The court decision, therefore, must deliver a stinging blow either to the rules or A. A. A.

WAVING aside the self-claimed right of the A. A. A. to sit in judgment upon a material matter, His Honor Judge Marean, of the New York Supreme Court, assumed jurisdiction of the litigation raised as to the possession of the Glidden Trophy. The hearing commenced Wednesday in Brooklyn, and will probably occupy several days.

This action on the part of the court creates a precedent, as in the past when a matter based upon any sport administered by a constituted sporting body was held to be outside of the jurisdiction of the courts of equity. The A. A. A. has asserted ever since its ruling in this case came into question that it alone had jurisdiction of automobile sports, but the Supreme Court takes a different view and the trial holds out promise of numerous interesting developments.

The history of the contest in brief outline covers the following main points. The Glidden Tour of 1910, conducted by A. A. A., had among its entrants a Premier six-cylinder automobile and a Chalmers four-cylinder car. Both were formally entered under the A. A. A. rules governing reliability contests. In order to be eligible to entry it was necessary for the entrant companies to file certificates showing in detail the mechanical and structural features of the cars and to come within the rule of A. A. A. with reference to stock car status.

Prior to the start the cars were carefully checked against these certificates and in both instances the cars were passed by the A. A. A. technical committee.

The field was small and would have been seriously affected by the ruling out of any likely contenders, as public interest in an event where the size of the competing list was limited to a handful of automobiles had been proved to be limited.

The route was long and arduous, extending nearly 3,000 miles over particularly vicious roads, and at the finish at Chicago the Premier was assessed 93 points penalty and the Chalmers 116 points, they having the least number of demerits of any of the Glidden cars to complete the course in competition. Referee Whiting thereupon pronounced the Premier car winner of the trophy. The Chalmers entrant then filed a protest with the referee in due form against awarding the trophy to the Premier, alleging that the winning Premier was not a stock car and was equipped with certain things, particularly a hand oil-pump and tank, that rendered it ineligible to compete as a stock model.

Referee Whiting heard the protest and overruled the objection of the Chalmers entrant on the ground that if there was any merit in the protest it should have been made before the start of the tour.

This is the crux of the situation as it stands before the court at present. The dispute was carried to the A. A. A. on the protest of the Chalmers entrant, and at a hearing that was delayed several weeks after the finish of the race the decision of the referee was overruled and the trophy awarded to the protesting party.

At this hearing it was brought out that the A. A. A. had every opportunity to determine beforehand whether or not the Premier car was eligible to compete, and that except on the hypothesis of glaring neglect there was no way to reconcile its action in allowing the car to compete than that the car was eligible.

The position taken by the Chalmers entrant is in perfect accord with good sporting ethics and no fault has been found with the effort to secure the coveted trophy under the rules made on that behalf.

But with reference to the position assumed by A. A. A. there has been a swamp of criticism. It has been emphasized that the A. A. A. has formulated its own rules and regulations for the conduct of just such contests as the Glidden Tour. That it is to be presumed that the rules so formulated are satisfactory to those who made them and that with all those things in its favor the A. A. A. allowed the Premier car to start in competition and after the car had finished with the winning score the A. A. A. set up the claim that the car was ineligible to start in the event, much less compete and win the trophy.

The proceedings in the Supreme Court on Wednesday were largely of a preliminary order. Sidney S. Gorham, of Chicago, and George C. Lay are handling the Premier side of the argument and are opposed by Job Hedges and Richard Ely for the Chalmers company. The rulings of Judge Marean narrowed the issue materially during the opening session and both sides are distinctly upon their mettle.

The point at issue is as to the oiling device. It is admitted by A. A. A. that the stock certificate filed by the Premier company included a detailed statement of the fact that the car carried such a device; that if it had done it full duty in the matter that a different state of affairs might have been uncovered before the start; that it could find no substantial fault with the Premier entered car as is evidenced by the fact that it was allowed to compete.

The merits of the case are before the court and must be determined by the court alone and with these the general public is not particularly interested. But the fact that a weak-kneed, dilatory policy upon the part of an alleged governing body of a constituted sport could blow hot and cold over the same set of facts is a matter that is of interest to the whole of motordom.

No matter what the final decision of the case may be the A. A. A. is placed in anything but an enviable position with relation to motordom generally. If Premier prevails, the integrity of the stock car certificate and the reliability rules of A. A. A. will be sustained and the action of the A. A. A. in overruling its own rules and stock-car certificate will be given a stunning blow.

In case Chalmers is upheld the stock-car certificate and reliability rules will be overthrown and the A. A. A. action in overthrowing its own regulations will be supported.

It matters little to motordom whether the Chalmers or the Premier gets the trophy, but no possible decision of the court can save A. A. A. from being put in a ridiculous position.

Supreme Court of Contests Appointed

Judge Alton B. Parker, of New York, Head

Former Justice Parker and Other Well-Known Men Have Been Appointed by the Manufacturers' Contest Association Through Its Duly Constituted Committee to Serve as a Court of Appeals to Which All Disputes That Cannot be Settled in the Ordinary Way Will Be Referred for Final Adjudication. This Court Will Be Known as the Board of Review.

IN view of the disorder that followed the Glidden Tour of last year in which the rulings of the officials in charge were called into serious question, and considering the point made by some of the contending companies that it is not good form to place a man in the dual position of contender and judge, it has been the idea of the men who conduct the affairs of the Manufacturers' Contest Association that a board of review should be instituted, the same to be made up of men of a high and judicial standing, who are not connected either with contests or with the conduct thereof. The glaring evils that marked the promotion of race-meets in the past are slowly being eradicated, and the appointment of this board of review is probably the greatest move for the advancement of clean racing that has ever been made. According to the information at hand the board of review is to have a personnel including former Judge Alton B. Parker, of New York; Judge George T. Cann, of Savannah; Bartow S. Weeks, of New York; and Everett C. Brown, of Chicago. The remaining members of the board of review have not as yet been appointed.

Among the remaining activities of the governing bodies of the Manufacturers' Contest Association there still remains the organization of the administrating committee which will regulate freight automobile contests, the rules for which are still in the embryo. The plans for freight automobile contests are on a broad foundation, and it is the purpose to appoint from among the makers of freight automobiles an active committee of five members, which, in addition to the completion of the rules that are being formulated, will supervise activities under them.

Will Meet to Reorganize the A. L. A. M.

Sixty of the leading members of the automobile manufacturing industry will gather together Thursday at the headquarters of A. L. A. M. to consider ways and means of reorganization of that body. Last month it was announced that this would be done at the April meeting and the impression was given that the organization would be crystallized.

Since that time, however, the statement has been made, coming from apparently authoritative sources, that the April meeting will not complete the work in hand and that it will require at least one more general meeting and perhaps two executive committee sessions to place the new concern in working order.

On Wednesday the executive committee convened and according to report considered only a series of routine matters.

It is understood that several of the sub-committees named in March are unready to report. These are said to include the sub-committee that is taking up the various patents that are proposed to be made the substance and foundation of the new organization.

The name of the new body has not been selected and there are several of the manufacturers who seem to think that no change in name will be necessary because if the basis of the organization is a series of patents, the members will be licensees and the association might with appropriateness be termed the "Association of Licensed Automobile Manufacturers."

According to the best available information, the meeting Thursday will approve of the routine matters taken up by the executive committee and will hear reports of progress from the sub-committees.

In May, it is believed the final stage of the reorganization will be reached.

In speaking of the situation, one of the manufacturers said rather plaintively:

"I have never found an inventor who considered his patent worth less than $1,000,000."

Whether he referred to the present business of the A. L. A. M. sub-committee, which is considering various patents, was not stated.

Chalmers Will Have a Busy Week

Hugh Chalmers, president of the Chalmers Motor Company of Detroit, has an extremely busy week ahead of him in New York. Mr. Chalmers arrived in this city Tuesday on a double mission. In the first place he is here to answer the action of the Premier Motor Car Company of Indianapolis in the Supreme Court at Brooklyn, which was brought to settle the case of the award of the Glidden Trophy in 1910.

An injunction was asked by the Premier company to prevent the delivery of the cup according to the terms of the award and was ultimately denied. The matter was then placed upon the docket for examination into the merits of the case. This case came to trial Wednesday morning. Mr. Chalmers' presence is required in court in this proceeding but that is not the only reason for his being here at this time.

The reorganization of the A. L. A. M. has reached a critical stage and the executive committee of that body is in session today. Mr. Chalmers is a member of that committee, and while he probably will not have time to put in an appearance, he hopes to be on hand for the general reorganization meeting that is scheduled for Thursday.

In discussing matters of interest to motordom, Mr. Chalmers made the following statement to THE AUTOMOBILE:

"Naturally enough I am not at liberty to discuss the Glidden Trophy litigation. The hearing may occupy a week, but we shall make a motion to dismiss the matter on the general ground of lack of jurisdiction on the part of the Supreme Court. This motion will probably be made at the outset and if it prevails it will settle the proceeding.

"As far as the executive committee meeting of A. L. A. M is concerned, I do not anticipate that anything of much importance to the public will happen. In fact I have been assured that the matters to be considered are routine and that my presence will not be necessary. The general meeting, as I understand it, will be governed largely by what develops during its session and may or may not prove to be of much importance.

"We believe that automobile racing is a good thing for those factories whose product is just coming on the market. Racing is valuable to the engineers and designers of such cars because the unusual strains and stresses are likely to expose defects in construction that may be remedied and it is of value to the public if it shows that the cars are sturdy and speedy.

"In the past the Chalmers company has entered 150 races and while the company will not have a car in the Grand Circuit train of 1911, it is quite likely that we shall enter a few contests."

Michigan Makers Go to Lansing

Present Strong Argument Against House Bill No. 224

Twenty prominent builders of automobiles in Michigan put quietus on House Bill No. 224, which passed the Michigan House and is pending in the Senate. This bill has for its object the legalizing of the United States standard of taps and dies, and it is proposed to make it a misdemeanor to use any other than this standard of taps and dies in the building of automobiles and other vehicles. Among those who journeyed to Lansing was Mr. Wills of the Ford, Russell Huff of the Packard, Mr. Boyer of the Boyer Adding Machine Company, H. E. Coffin, vice-president of the Hudson; Henry Souther, president of the S. A. E., and in fine an array of authority along automobile lines that should impress the Michigan Senate with the accuracy of the contention that the United States standard of taps and dies is unsuited to the building of automobiles.

DETROIT, Apr. 5—The latest phase of the flurry that was brought about by the proposal on the part of the Michigan House and Senate to legalize the United States Standard of taps and dies has to do with a future condition that will prevent the Michigan State authorities from interfering with the building of automobiles, and this is only possible if the objections that are now made to the practice of using all sorts of threads in automobile work are silenced. The standardization work that has been going on through the efforts of the Society of Automobile Engineers must be pressed to its final conclusion, and it is pointed out by eminent automobile engineers that the A. L. A. M. standard threads should be refined to whatever extent the occasion requires, and then approved as a standard, after which it will be necessary to have the various manufacturers and dealers in bolts, nuts, studs, etc., carry these products in stock, so that automobilists everywhere will be in a position to make a replacement at a reasonable cost and within a short period of time.

There seems to be a lack of information on the part of automobilists and the Michigan Legislature in relation to the progress that has been made in matters of this sort, and it has been suggested that the builders of automobiles awaken themselves to the necessity of forcefully presenting the facts. Moreover, it will be desirable on their part to maintain an alert attitude and to be ready for any eventuality. The committee of twenty that journeyed to Lansing are impressed with the fairness of the legislative committee, and it is believed that the danger which was threatened has been alleviated for the time being.

Date of S. A. E. Summer Meeting Fixed

The Council of the Society of Automobile Engineers, Which Is Holding Its Meeting in New York City as The Automobile Goes to Press, has fixed upon Dayton, Ohio, as the Place of Holding of the 1911 Mid-Summer Meeting, and a Special Program Is Being Formulated to Make June 15, 16 and 17 the Busiest Days of the Year for Automobile Engineers. Among the Special Features, in View of the Fact that Dayton is the Home of the Wright Brothers, Interesting Flying Demonstrations Are Promised.

WHEN the last mid-summer meeting of the Society of Automobile Engineers was held in Detroit, Mich., the membership of the society was a sparse 300. Since that time the S. of A. E. has grown by leaps and bounds, and the 800 members of to-day will be supplanted no doubt by at least 1,000 members when on June 15 next, the society will assemble at Dayton, O., for the purpose of reviewing the work of a year, and with the intention of completing the standardization problems that have long held as the most important undertaking of the engineers. The council has also decided that the society should publish a monthly bulletin, somewhat newsy in character, that will have for its main purpose, a regular channel for keeping the members in touch with the current situation. Other important business is being discussed.

The first meeting of the Metropolitan Section of the Society of Automobile Engineers was held on Monday, April 3, at the offices of the society. Wm. P. Kennedy acted as temporary chairman and Coker F. Clarkson as secretary of the meeting. The members present decided on the formation of a committee on organization of three, comprising the chairman, secretary and Joseph Tracy.

The following members attended the meeting on Monday: Geo. Norcross, Joseph Schaeffers, Coker F. Clarkson, Wm. P. Kennedy, Radclyffe Furness, M. B. Pope, F. D. Howe, J. W. Breyfogle, Robert N. Bavier, Ernest Fried, C. B. Haywood, A. F. Masury, Joseph Tracy, Hermann F. Cuntz, Chas. E. Stone, R. W. Knowles, J. C. Chase, H. W. Slanson, J. G. Weiss, F. S. Sayre, H. A. Bugie, Joseph Bijur, Geo. K. Bradfield, Harold H. Brown, W. H. Shoudy, J. E. Wilson, A. J. Slade, F. W. Trabold, E. T. Birdsall, M. C. Krarup and H. M. Swetland.

Considerable interest in the plans and great enthusiasm were manifested by the members. The method in which meetings of other engineering societies are conducted was also considered. At future meetings of the Metropolitan Section of the S. A. E. there will be presented and discussed papers dealing with professional subjects; there will also be conducted discussions of topics of interest which will be announced by the chairman of the meeting.

The Metropolitan Section is the first of several local sections of the S. A. E. to be established in those cities where the industry is represented by a considerable number of members, as Detroit, Chicago, Philadelphia, Cleveland, Buffalo, Hartford, etc. There is a great deal of interest throughout the country in the organization of these local sections.

The Organization Committee of the Metropolitan Section is making its report to the counsel of the S. A. E. on Wednesday, together with a request that the organization of this section be authorized along specific lines.

After the discussion of the plans of organization was completed, a brief report of the Lock Washer Division of the S. A. E. Standards Committee was made. Then a report on behalf of the Woodwheel Division and Fastenings for Tires Division of the Standards Committee was made, being followed by a discussion of the subjects in question.

A meeting of the Lock Washer Division is being held at the offices of the society on Wednesday, April 5. The division is composed of A. C. Bergman, Fiat Automobile Co.; Henry A. Bugie; Coker F. Clarkson; F. S. Sayre, Positive Lock Washer Co.; Henry Souther, president of the society ex officio; J. E. Wilson, National Lock Washer Co.

On Friday afternoon a meeting of the Woodwheel Dimension Division will be held at the offices of the society, 1451 Broadway. It will be attended by the representatives of the manufacturers of solid tires, and the subject of standard diameter woodwheel felloes will be taken up in view of the progress that has already been made.

Syracuse Club to Abandon A. A. A.

SYRACUSE, N. Y., April 3—There seems to be a strong probability that the Automobile Club of Syracuse will withdraw from the American Automobile Association and the New York State Automobile Association, and that the Rochester club and other organizations will follow suit. There is a strong feeling among members of both the Syracuse and Rochester clubs favoring this move.

The trouble arises over the Callan automobile law, which has been unpopular with automobilists of the Empire State since it went into effect a few months ago. Secretary of State Lazansky is notifying automobile owners who have not yet taken out 1911 licenses that they must get them at once or be arrested. The local headquarters are at the Packard garage, 410 West Onondaga street. Unless car owners get their number plates at once they must send to Albany for them and pay the charges themselves, claim the authorities, although the new Callan law provides that license plates shall be delivered to motor car owners at no expense to themselves. This section of the Callan law is causing trouble and lawsuits through the State, and the Syracuse and Rochester clubs claim that the State association should take some hand in it.

A meeting of the State association is called at Albany on Saturday of next week. President Hurlbut W. Smith, of the Syracuse club, who is also the treasurer of the State body, will be there, and it is said here that the future of the State body hangs in the balance. The alleged indifference of both the larger bodies mentioned to the stand taken by the Secretary of State's office has bred deep resentment here. Then, too, the Syracuse and Rochester clubs will insist upon a number of changes in the State body by the American Association.

The officers of both clubs declare them strong enough to continue doing business without the larger organizations. At next Saturday's session it is said that officers of both the Syracuse and Rochester clubs will insist upon a number of changes in the present manner of transacting business.

Trucks on Show at Pittsburg

PITTSBURG, PA., April 3.—Pittsburg's show season, lasting two weeks and including the big Exposition show at the Point and the show put on by the Automobile Dealers' Association of Pennsylvania at Duquesne Garden last week, wound up Saturday night with a record-breaking crowd. Hardly had the doors been closed when a big force of men set out to clear the Garden of the pleasure vehicles and make ready for Pittsburg's first commercial vehicle show, which opened to-night.

In the degree of interest manifested by business men throughout tri-State territory, this latter show promises to be quite as much of a success as the preceding two exhibits. The decorations and mural paintings, with all the electric displays, were left in the Garden and hundreds of business men visited the show the opening night.

The attendance at the Duquesne Garden show was 26,852. The revised list of motor truck exhibitors is given herewith:

Buick, delivery wagons.

Garford.

Mack.

Packard (Standard Automobile Company, agents), Packard 3-ton fire truck, 3-ton chassis, chemical tanks, etc.; three 10-ton service trucks, 3-ton service truck (chassis), 1½-ton truck, Packard ambulance, quick delivery, fire wagon, police patrol.

Pierce-Arrow (McCurdy-May Company, agents, Pittsburg, Pa.), Pierce 5-ton trucks.

Sampson (United Motor Company, agents), Sampson ½-ton, 1-ton, 2-ton, 3-ton, 4-ton and 5-ton vehicles.

Stoddard-Dayton (Keystone Auto Company, agents).

Peerless (Hiland Auto Company, agents).

White, 1,500-pound delivery wagons, 3-ton trucks in various models.

Vestal Motor Truck Company.

Franklin Automobile Company, 5926 Baum street, Pittsburg, Pa., Franklin 1-ton trucks, stake platform, one express body, one ambulance, one 1,000-pound delivery wagon, one taxicab.

Pennsylvania Motor Car Company, 916 Boquet street, North Side, Pittsburg, Pa., Lyons 1-ton trucks.

Rapid Motor Truck Company, Rapid 1-ton truck, 2-ton truck, 3-ton truck.

Automobile Blue Book Expanding

The contract between the Automobile Blue Book Publishing Company and the American Automobile Association under which members of the Association were enabled to obtain copies of the Official Automobile Blue Book at a reduced price has expired and will not be renewed. During the past seven years the publishers of this well-known work have expended hundreds of thousands of dollars to make the book of the greatest possible value to the tourist. It has grown from a small booklet of a few hundred pages to four big volumes, averaging over nine hundred pages each, filled with maps and information covering over one hundred and fifty thousand miles of routes. This growth has been obtained only by the constant labors of a score of expert route finders and topographers and the use of many cars in various parts of the country. The publishing company has carried on this work solely with its own staff and at its own expense and to-day possesses a fund of touring information unequaled anywhere. The 1911 volumes, which are now on the press, will be extensively distributed and can be obtained by motorists from all dealers, supply houses and automobile clubs.

Lazansky's New York Office

Edward Lazansky, Secretary of State, has opened a branch office for automobile registration and chauffeurs' licenses at Seventy-fourth street and Broadway. Renewals of licenses will not be handled at the New York branch this year, but it is announced that such procedure will be cared for next season.

The New York district comprises New York, Kings, Queens, Nassau, Suffolk, Westchester and Richmond Counties, and 60 per cent. of the State registrations come from this district.

New Jersey Blue Book Coming

Containing more touring information, garage statistics and maps than ever before compiled in a like volume, the New Jersey section of the Blue Book, volume number 3, will be issued about the middle of the current month. The New Jersey section contains maps and information covering the State in much detail and also carries full descriptions of popular Southern tours in Florida, Georgia, Alabama and the Carolinas.

The New York section, volume number 1, will appear soon after the New Jersey volume. Volume number 2 is the New England section and number 4 is the Western division of the work. This latter will be published as heretofore at Chicago.

A Fair Patron from an Elite District

Fair Lady (to the butler)—James, 'phone de chauffeur an' tell him to roll the limousing up to the doa' at once, I desiah tu go shoppin', an' what man, don' you all forget tu tell dat lazy vermin tu hot-foot it.

Fair Lady (descends from the limousine and enters a drug store) to the obliging white drug clerk—Ah wants tu cents' warth o' insect powda.

Obliging Clerk—What! Do you expect me to wrap up two cents' worth of insect powder for you? Do you think I have nothing else to do?

Fair Lady—You all misconseption ma intension, what man; what you all kin do is tu drop dat insect powda down ma back, raght heah.

National Circuit Arrangements Consummated

Papers were filed at Albany for the incorporation of the National Motor Contest Circuit. This is the culmination of the effort that has been under consideration in substitation of the way that was sanctioned by the management of the American Automobile Association in the past. The new idea is favored by the Manufacturers' Contest Association. About twenty-five makers of automobiles belong to this association. H. E. Coffin is president of the manufacturers' organization and Howard Marmon is vice-president of the same. The plan of the new company was fully stated in The Automobile under date of March 23. The new concern has opened headquarters in New York at 437 Fifth avenue. A. R. Pardington is managing director and treasurer of the company. The special train service, which is to be the spectacular feature of racing this year, has been decided upon as it was outlined in The Automobile in its leading article of March 23. The train, as indicated by present prospects, will comprise enough cars to accommodate thirty racing automobiles and the crews. In the controlling of racing under this plan, it is pointed out that all events will be supervised by an identical set of men. The circuit is spread over a map that will require about 7,000 miles of railway traveling to cover it. Provision will be made in the train for a machine-shop car; this should prove of great advantage to the makes of automobiles that become disabled and have to be repaired. Lathes, drill presses, a capable forge and ample small tools will be at hand.

The railroad cars will be painted of a uniform color and lettered, giving the names of the automobile makers that will occupy them, as was previously shown in The Automobile. The present plan is to make ready for the big event at Indianapolis on May 30. The train will then take the racing teams abroad and the "Grand Round" will be started. The "National Circuit" will include points in the Far West, according to the promoters, unless signs fail.

The active personnel of the new National Circuit venture includes Chairman S. M. Butler of the Contest Board, whose work last year was the bright spot in the racing situation. With Mr. Pardington as referee, Chairman Butler in his old position, F. E. Edwards as chairman of the technical committee and H. H. Knepper in charge of timing, Wagner will complete the force.

Jacobson-Brandow Opens New York Office

The latest comer in the New York sales field is R. W. Augustine, who has taken up the work of New York sales representative of the Jacobson-Brandow Co., with an office at 116 Nassau street. The company, with its well-equipped establishment at Pittsfield, Mass., is prepared to put a stock of magnetos, and coils, with parts, in New York, and to extend to its clientèle prompt and efficacious service.

Dealers Appoint Truck Committee

The tremendous growth of the motor truck industry has been brought very forcibly to the attention of the automobile dealers and the business world during the past year. That the public are thoroughly interested in the commercial automobile was proven at the recent commercial vehicle shows in New York, Chicago and Boston, where the daily attendance was enormous.

Feeling that this part of the industry warrants an Association to look after its interests, the Licensed Automobile Dealers of the City of New York, at a board of directors' meeting held Tuesday, made an investigation and found that over 95 per cent. of their members are handling commercial vehicles. This association has proven a strong factor in the pleasure car portion of the automobile industry and the Board decided that it was now time to take an active part in the commercial side. To that purpose, a committee known as the "Motor Truck Committee" was appointed. Mr. Milton J. Budlong, president of the Packard Motor Car Co., was appointed chairman. Mr. Robert D. Garden, president of the Harrolds Motor Car Co., and Mr. R. H. Johnston, of the White Co., were selected to serve on this committee.

Inventor Bosch Touring This Country

Robert Bosch, doctor of engineering, of Stuttgart, Germany, who numbers among his many attainments the invention and design of the well-known Bosch magneto, has arrived in America, and with President Otto Heins, of the Bosch Magneto Company, of New York, is undertaking an extended tour of the United States with the object of visiting some of the large automobile plants, and rounding out numerous of the Bosch undertakings. Dr. Bosch expresses an exceeding interest in the American industries, marveling somewhat at their extent.

Lovell-McConnell Co. to Make "Safeguard"

The Lovell-McConnell Manufacturing Company, of Newark, N. J., announces to the trade that it has taken over the entire sales of the Conover bumper, as it has been known heretofore, but it is proposed to change the name so that it will read the Conover safeguard. This safeguard will be manufactured as formerly by the New Jersey Tube Company, of Newark, N. J.

Book of the Private Garage

JUST from the press of the *American Architect*, 231 West Thirty-ninth street, New York, with 64 plates and 23 pages of descriptive text, the book entitled "Garages, Country and Suburban" is attracting discriminating notice. This book is 9 x 12, substantially bound in cloth, and is devoted to the private garage, presenting many examples as they obtain in actual practice, and useful hints to the owner of a car who might desire to build a garage, and who would wish to merge art with those practical considerations that make for safety and utility. One of the particular advantages of this work was bestowed upon it through the keen desire on the part of the author to eliminate everything from the text but the character of the material that will prove of immediate value to the man who wants the best but has no time to weed out irrelevant matter. A chapter is devoted to the facilities in the garage, by means of which gasoline and other inflammable material is handled with perfect safety, and the questions of natural illumination, in other words, a utilization of daylight, are fittingly extolled. Certain of the illustrations deal with the problems involving cement for floors and foundations. Ventilation is given its quota of attention, and the dangers of a pit, so-called, are tersely pointed out. As a fitting substitute for a pit, considering the facility with which it will hold mixture of the explosive sort, trestles in several simple designs are presented with sufficient data to serve every practical purpose. The interior arrangement of beautiful examples of garage work is shown, and how to store the tools and other accessories to the car is one of the matters that has been given good attention. Safe lighting and provisions for heating without danger are treated of, and the facilities required in the washing of automobiles are illustrated and discussed.

On page 18 a quaint and unusually interesting cement garage is shown in its setting with a woodland surrounded by a high brick wall, indicating how the garage instead of being an eyesore has a decorative value, and from this point on the beautifully wrought plates, from 1 to 64 inclusive, offer the widest opportunity to the owner who wishes to follow precedent, and a splendid chance to depart in the direction of advancement along consistent and recognized lines. The price of this work is $4.

New Things Among the Accessories

STANDARD SPEEDOMETER

THE principle on which this speedometer works is illustrated in Fig. 1. The sliding weight governors slide on rods and when motion is imparted these fly out by centrifugal force and cause the central

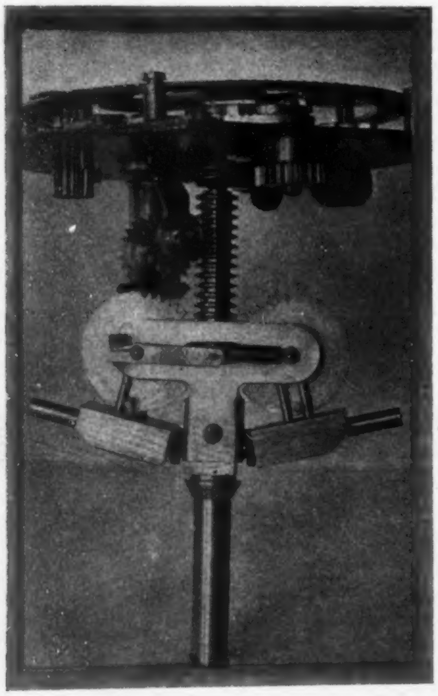

Fig. 1—Showing the working parts of the Standard Speedometer

spiral to descend as it is in mesh with the discs that are rotated by the action of the governor. Meshing with the spiral there is a cross-shaft carrying a bevel gear which transfers the lateral movement into a vertical one, thereby causing the recording hand to move over the dial and so record the speed. The odometer and trip recorder are operated by spiral gearing from the main shaft. As the speed decreases the governors fall back by gravity as the rods on which they slide are inclined. A ball bearing is used to support the main shaft. This instrument is the product of the Standard Thermometer Co., Shirley street, Boston, Mass.

DASHBOARD HEADLIGHT CONTROLLER

THIS device as shown in Fig. 2 has for its object the controlling of the flow of gas to the headlight from a gas tank. By turning the lever the height of the flame can be turned high or low at will and is a means of economizing gas and doing away with the necessity of getting out of the car to attend to the lamps while passing through town. The fittings are shown and connect with the tank to the controller and the controller to the lamps. The device is manufactured by the Scheu Dexter Mfg. Co., Springfield, Mass.

TRIUMPH GASOLINE TANK GAUGE

THE component parts of this gauge are shown in Fig. 3. The cylinder with the spiral slots fits inside the tank from the top to the bottom and inside this the float with a notch that fits in the slot operates. The float has a flat slot in the center to accommodate the shaft that carries the magnetized bar. The action of the gasoline in rising and falling is to cause the float to ascend or descend and as it must rotate owing to the spiral in which it works the magnetic bar also turns and the needle, which is magnetized as well, is made to rotate. With the aid of washers the tank is made air-tight and the gauge portion is entirely independent and can be removed at will. Any length of cyl-

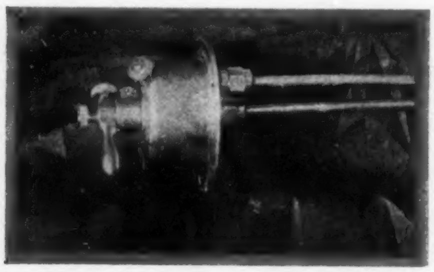

Fig. 2—Scheu High-Low Headlight Controller for dashboard attachment.

inder can be supplied by the makers, The Boston Auto Gauge Co., 8 Waltham street, Boston, Mass., if the depth of the tank is given.

THE YALE HORNBLOWER

THERE is now being marketed a new hornblower which is a radical departure from the old sidereaching method of blowing by bulb compression. The device may be attached anywhere the user thinks most convenient. Rapid tremulous toe action results in a commanding tattoo and an equally effective warning is accomplished by slow long horn blast, and this with any autohorn from the smallest ordinary autohorn to the large combination signal. The device is made by the Inland Mfg. Co. of Milwaukee, Wis. is A special feature is its quick telescopic castoff connection enabling access to any part of the machine under the footboard.

A SIMPLE DEMOUNTABLE RIM

SIMPLICITY marks the Booth Demountable Rim, made by the company of that name, of Cleveland, O. The equipment includes a standard rim on which any make of tire can be used; a rim fitted to each wheel and an extra rim equipped for an inflated tire. When overtaken by tire trouble it is an easy matter to remove the damaged tire and its rim and replace it with the spare rim and its inflated tire, with but a moment's delay. There are no loose parts to lose, nor clamps to adjust; it is a self-locking device and automatically forces itself on and off.

SMALL BUT POWERFUL JACK

THE Barrett automobile jack, made by the Duff Manufacturing Co., of Pittsburg, Pa., is built for the rapid, convenient and economical handling of any motor car and is recognized as suitable for every automobile service. It is quick acting and automatic, and is built along the same lines as the large jacks designed for heavier railroad service.

The jack is built small and light in

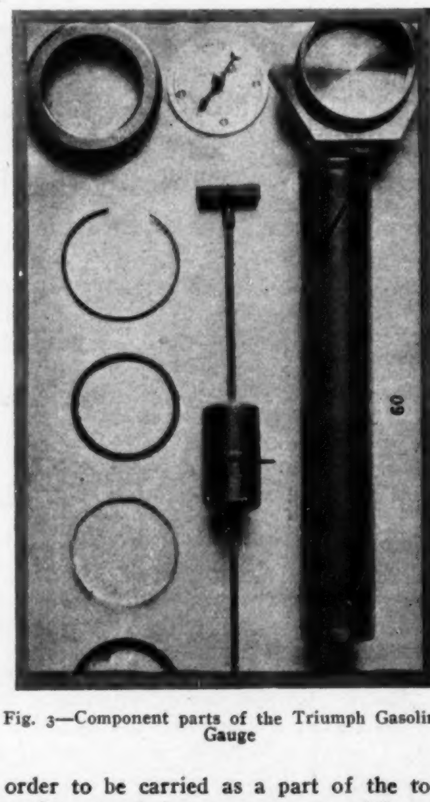

Fig. 3—Component parts of the Triumph Gasoline Gauge

order to be carried as a part of the tool equipment of the average automobile. It has a capacity of 2,000 pounds. There are three sizes of the Barrett jack, weighing 9, 8 1-2 and 7 pounds respectively.